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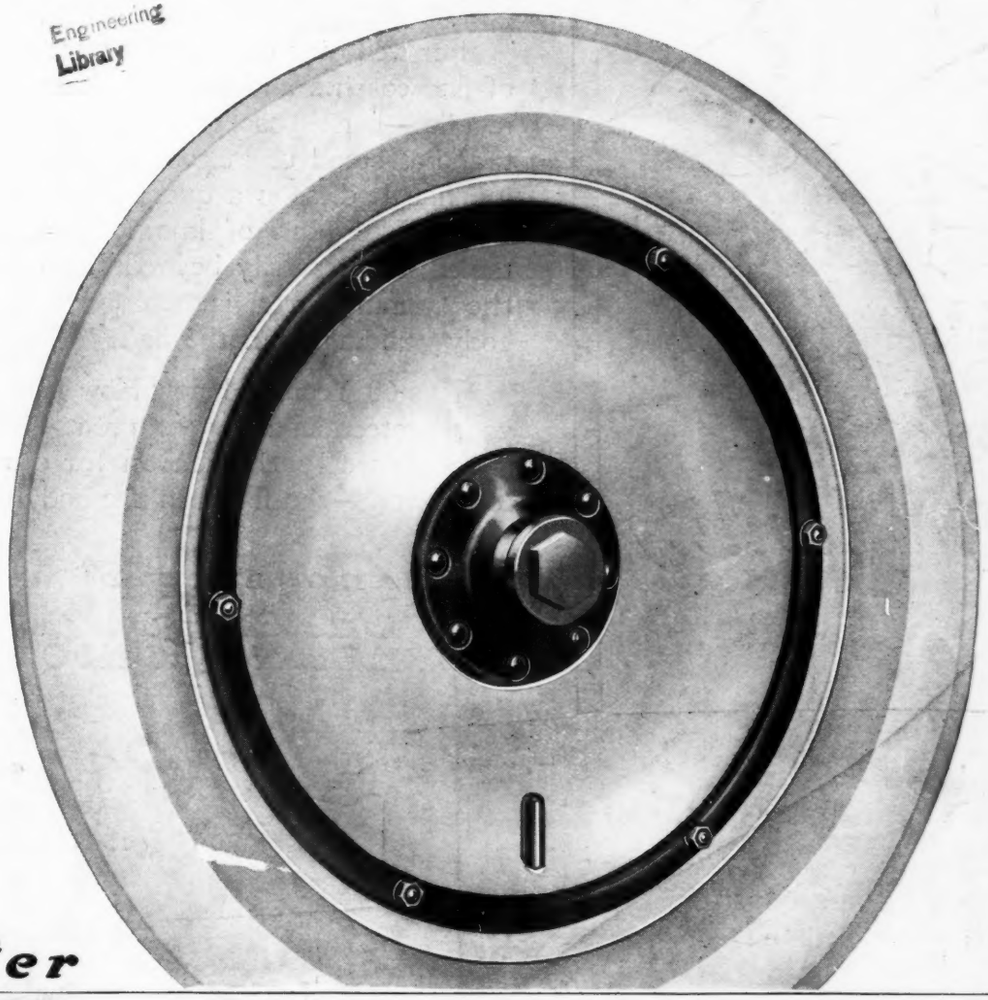

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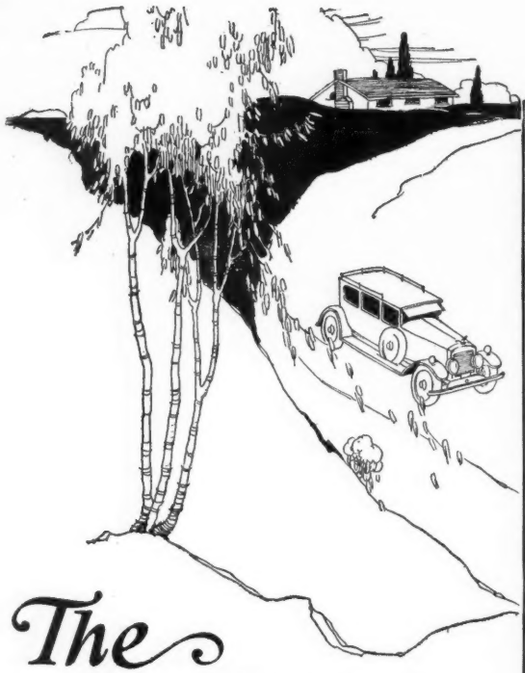

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AUTOMOTIVE INDUSTRIES
The AUTOMOBILE

VOL. XLVI. NEW YORK—THURSDAY, APRIL 20, 1922 No. 16

Hoover and the Trade Associations

Secretary of Commerce has outlined functions of trade associations. He is promoting his ideals by co-operating with such organizations. Automotive industry Contact Committee formed on foreign trade. Program warrants manufacturers' support.

By Norman G. Shidle

HERBERT HOOVER is giving to many trade associations and to many trade association members a conception of the functions of such organizations that are very largely new. And the associations are rising to meet the Hoover ideal.

Hoover believes that the trade association has some fifty or sixty constructive functions, and he is quietly but constructively showing trade association members and secretaries how they can fulfill a larger field of usefulness than has been the aim or idea of many in the past. The Hoover trade association ideal is worth the serious attention of every automotive executive directly or indirectly connected with trade association activities.

Hoover has taken for granted the idea that trade associations have been formed primarily to perform the constructive functions which lie within their power. He believes in the fundamental honesty of the majority of American business men; that American business recognizes that in the long run the best interests of the public are identical with the best interests of business.

These opinions attributed to Mr. Hoover are not quotations, but rather an interpretation of the attitude of the Secretary of Commerce as noted in his various public utterances about trade associations in general and in his meeting with the trade association secretaries in Washington last week in particular.

Many trade associations were not formed primarily for the broad educational purposes outlined by Hoover as the real function of such organizations. Nevertheless, it is true that their future growth and progress depend primarily upon a recognition of these possibilities and an attempt to fulfill them to the highest degree.

Over 500 people, interested in or connected with trade associations in an official capacity, met with Hoover in Washington last week and discussed trade associations and their activities. The men at that meeting were given an accurate conception of what a real trade association might do in the way of public service and what assistance the Department of Commerce may be expected to render.

"The trade association is a college of business," Hoover stated. "So long as its activities are such as to fulfill that primary educational function, no question of law will ever bother it. It is when it steps outside of this educational field that it goes into the twilight zone.

"There are so many useful constructive functions

for a trade association to perform that it seems foolish to take the changes entailed in entering that twilight zone. Moreover, it is doubtful whether or not there is any real economic advantage to be gained by members of the trade association through the activities in this twilight zone. The commercial value to members of such activities has been greatly exaggerated."

By emphasizing the possible constructive functions of the trade association Hoover is focusing attention upon the really essential phase of the whole trade association discussion. The individual members of a trade association will benefit far more in the long run through constructive association activities useful to the public welfare than by the conduct of such secret activities as might give to those members a temporary commercial advantage. This fundamental fact is true regardless of the restraint of trade act.

Manufacturing organizations in the automotive industry are facing problems of marketing and production such as have never confronted them before. The amount of commercial and engineering research necessary during the next few years is tremendous. Trade associations capable of visualizing these problems and attacking them in a constructive way are a part of the automotive industry. Any organization busy studying and solving these problems will have little time left for illegitimate activities.

Whatever statistical data are needed for the illumination of such studies can be gathered without much danger of legal interference. Data for such purposes constitute part of the educational function of the trade association. Publication of such figures is desirable, if for no other reason than to make perfectly obvious the fact that compilation has been for purposes of research in keeping with the best interests of the entire social and business community. Prices are not nearly so essential as much other data, and Hoover believes an association wise to refrain from gathering price data.

Hoover says that legitimate trade association activity is vital and must be encouraged, and that of the 2000 trade associations in this country, a vast majority are concerned wholly with such legitimate activities. He emphasizes, however, the fact that the Department of Commerce, in its offer to receive statistics from trade associations and disseminate them to the public, cannot in any way deal with the so-called open price associations. Moreover, the Department has not and will not attempt to interpret the law.

The Department of Commerce is not only outlining the many constructive functions of the trade association, but is putting its ideas into practice. In its efforts to co-operate practically and constructively with American business, it is making excellent use of the facilities for contact and co-operative work given by the various trade associations.

There is no better example of this than the vital activities which are being carried on by Gordon Lee, Chief of the Automotive Division of the Bureau of Foreign and Domestic Commerce. The activities and general purposes of this division have been outlined previously in AUTOMOTIVE INDUSTRIES. Constructive work has been going on for over a year. Last week, however, organization was completed of a Contact Committee which will enable the Automotive Division to function even more closely and practically in the interests of the automotive industry.

On this Contact Committee is represented every section of the various groups comprising the automotive industry. The various trade associations of the industry have been utilized in its formation. Cars, trucks, motorboats, aircraft, motorcycles, parts, accessories, automotive equipment and automotive business publications are all represented on this committee which will advise with the Automotive Division constantly in the working out of the practical current foreign and domestic trade problems which come up from day to day.

Gordon Lee has been working on the formation of this liaison body for many months. Last week it held its first meeting. The event was more important than might be recognized at first glance. The gathering of this Contact Committee marked the first coming together of all groups of the automotive industry for a joint consideration of the problems and opportunities of selling American automotive products in foreign countries.

HOOVER seems to be more interested in having trade associations fulfill the constructive mission for which they have been formed than in discussing how near it is possible to come to breaking the law without actually doing so. He calls the trade association a "college of business" and says that "legitimate association work is vital and must be encouraged."

Constructive possibilities are being shown by cooperation between Automotive Division of Bureau of Foreign and Domestic Commerce and representatives of various trade groups within the automotive industry.

The committee consists of J. Walter Drake (Hupp Motor Car Corp.) and George F. Bauer, chairman and secretary of the foreign trade committee of the National Automobile Chamber of Commerce; W. O. Rutherford (International B. F. Goodrich Corp.) and M. Lincoln Schuster, chairman and secretary of the foreign trade committee of the Motor and Accessory Manufacturers' Association; W. G. McCann (Hendee Manufacturing Co.), chairman, foreign trade committee Motorcycle and Allied Trades Association; S. D. Black and G. W. Brogan (both of Black & Decker Mfg. Co.) of the Automotive Equipment Association; Luther K. Bell, secretary Aeronautical Chamber of Commerce; Ira Hand, secretary of the National Association of Engine and Boat Manufacturers, and George E. Quisenberry of the Class Journal Co. Additional members of this committee, but not present at the Washington meeting, are W. E. Green, representing the Association of Automotive Equipment Manufacturers, and Don F. Whittaker, secretary, foreign trade committee of the National Association of Motor Truck Industries.

The representatives of these various automotive organizations sat around a small table for eight hours and laid a firm foundation for the promotion of American automotive business abroad. They learned of the expert commercial information service that the Automotive Division is utilizing in all the principal countries of the world; how the needs of the different automotive manufacturers in the way of information and service were being met; how the Automotive Division has been turned into an efficient commercial organization functioning in a prompt manner.

The formation of this Automotive Division Contact Committee is typical of the way in which Hoover is promoting and utilizing the constructive features and possibilities of trade associations. The automotive industry is in an excellent position to benefit both by helping its trade associations to fulfill their very constructive aims and by co-operating with the Department of Commerce in its efforts to help American business.

British Oil-Cooled Car Engines

Originally introduced for motorcycles oil-cooling system is now applied to two and four cylinder car engines. It holds possibilities for higher efficiency, lower cost of production and greater ease of maintenance.

By M. W. Bourdon

AT the British Motorcycle Show of 1920 there appeared an engine utilizing the crankcase oil for cylinder and piston cooling. It was designed by Granville M. Bradshaw, whose success as a designer of air-cooled airplane engines during the war brought him into considerable prominence in England.

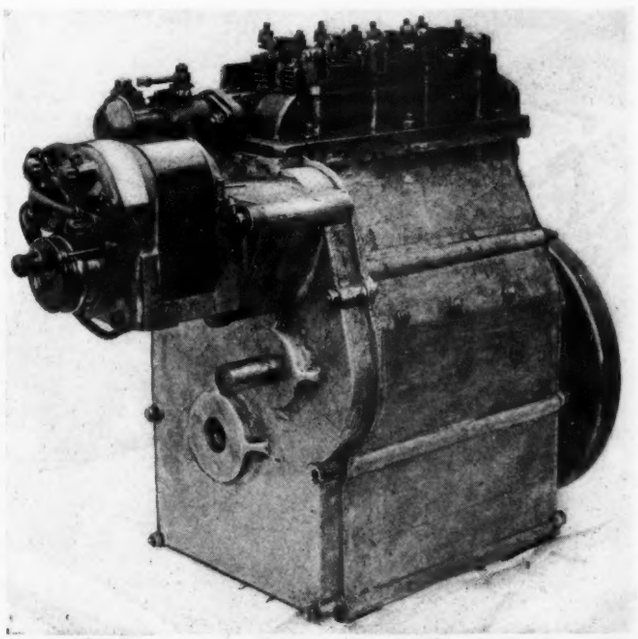
He became convinced that air-cooled engines are really oil-cooled, and that even water-cooled engines depend upon the lubricating oil quite as much as, if not more than, upon the water for conveying the heat away from the hottest part, the piston.

Bradshaw was led to this conclusion by experiments with an air-cooled stationary engine for driving wireless and searchlight dynamos. The first of these had a large fan placed at some distance for test purposes, with the result that it directed a portion of the air draught onto the crankcase. The engine ran on its first test under full throttle for 15 hours a day for ten consecutive days, without trouble. But later the design was modified to make a more compact unit with an enclosed centrifugal blower which directed the air through ducts directly on to the cylinder heads. The result was the engine would not develop the same power, nor run satisfactorily for long periods, and the crankcase became so hot that it actually melted the insulation of the magneto attached to it.

This experience showed that much of the heat absorbed by the combustion chamber walls is carried off by the crankcase oil. Later experiments by Bradshaw confirmed these results and subsequently Dr. Gibson, in his paper read before the I.A.E. indicated to what extent the crankcase and oil circulation assist cooling.

In two cases instanced he had proved that 40 and 47 per cent respectively, of the total heat absorbed by the walls was dissipated from the crankcase of engines in which that feature was not contemplated by the designer.

It occurred to Bradshaw, therefore, that if nearly half the cooling of an engine is accomplished by the crankcase unintentionally, a great deal more could be done in that way in an engine designed with that end in view, and he set to work to apply the idea in a practical form.



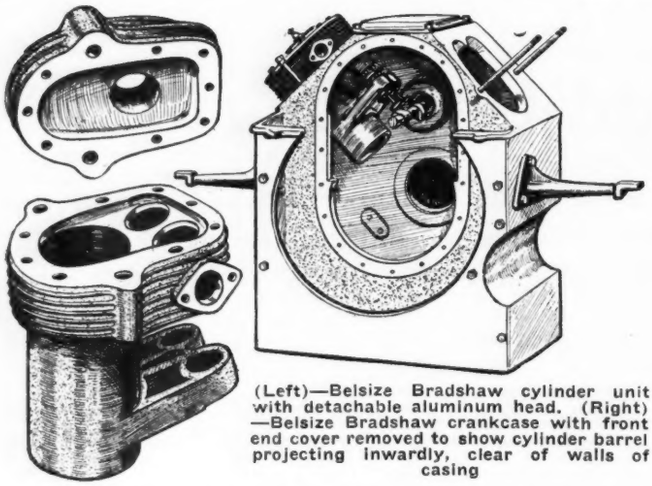
Marseal oil-cooled four-cylinder 2½ x 3½-in. engine, with ball bearing crankshaft. Cylinder barrel unit projects into crankcase, being secured by studs and nuts to underside of detachable cylinder head

Development of Oil-Cooled Engines

In the first attempt to make better use of the lubricating oil as a cooling medium (the motorcycle engine referred to) overhead pushrod-operated valves were used and dependence placed upon an air-cooled cylinder head for heat radiation. In his next move in connection with oil-cooling, he adopted an L head cylinder, and found that with this arrangement he was able to secure advantages which more than compensated for the loss of benefits generally ascribed to overhead valves; he was able to increase the area of parts cooled by oil and to include among these the valve seatings and stems, leaving air-cooling to take care of the top of the combustion chamber only.

At the Olympia Show in November last an oil-cooled two-cylinder Vee engine designed by Bradshaw was exhibited by the Belsize Co., one of the oldest of British motor manufacturers, with a plant capable of turning out about 50 to 60 chassis per week. Bradshaw, who is an independent engineer, was commissioned to design a light car with a two-cylinder engine; he submitted the oil-cooled engine, which was accepted after prolonged tests and put in production. Deliveries of the car began in December, and to all appearances, it is giving satisfaction to users.

The crankcase is an aluminum casting of exceptional size for an engine of these dimensions (3¾ x 4¾ in. approx. 83 cu. in.). It has a detachable end plate which supports the camshaft and crankshaft bearings at the front, while a forward extension of the main casting partially encloses the vaned flywheel, from which an air draft is directed upward to issue through sheet aluminum cowling. The cylinders are of cast iron with detachable die-cast aluminum heads and bronze bosses screwed into the aluminum for the spark plugs; only the heads and the finned combustion chambers project from the crankcase, the whole length of each cylinder barrel extending into the case, well clear of the sides of the latter. Cast with the cylinder barrels are lugs for the guides of the cam followers, and an important point is that the undersides of the valve seats in the cylinder casting are exposed to the crankcase interior.



(Left)—Belsize Bradshaw cylinder unit with detachable aluminum head. (Right)—Belsize Bradshaw crankcase with front end cover removed to show cylinder barrel projecting inwardly, clear of walls of casing

Two gallons of lubricating oil represent a full charge for the crankcase sump, and, at the normal engine speed (1000 r.p.m.), this is circulated at the rate of one gallon per minute by a centrifugal pump. The oil is delivered at high pressure via the main bearings and through the drilled crankshaft to the big-end bearings, whence a far greater quantity than usual is thrown off onto the inside and outside of the cylinder barrels, the inside of the pistons, the underside of the valve seats and the valve stems, as well as the camshaft, distribution chain, etc. All these parts are constantly drenched with oil. Instead of the heat from the piston crown, normally the hottest part of an engine, having to be carried off via the piston and cylinder walls, it is carried off directly from below by the large amount of oil which reaches it. Although cooling by this means occurs in any engine, usually there is insufficient lubricant in circulation in either of the latter types to be really effective as a piston cooling agent.

The large size of the crankcase serves not merely to allow the free circulation of the foam of oil about the cylinder barrels, etc., for it also provides a big surface—approximately 15 sq. ft.—from which the heat can radiate. In consequence, Bradshaw claims, the oil never exceeds a temperature of 190 deg. Fahr., and carbon deposit is not formed under the crown, which tends further to facilitate removal of the heat.

One of the objections to air-cooling is that the resonance of the unjacketed cylinder gives rise to excessive valve clatter and other noises. The large quantity of oil flying around in the Bradshaw crankcase serves as well as a water jacket in deadening sounds, and the engine runs as quietly as a water-cooled one of the same general type.

Bradshaw does not concern himself much with the cooling of the combustion chamber and cylinder head, but maintains that the prime essential is to keep the piston and valve seats cool. While, therefore, it is perhaps not quite correct to view this engine as oil-cooled alone, because of the air draught delivered on to the cylinder heads through cowling from the vaned flywheel in front, one is justified practically in almost ignoring the air-cooling feature.

It will probably be suggested that with so much oil in circulation, an excessive quantity will find its way into the combustion chamber and cause a smoky exhaust. But this does not occur in practice, at least not while the engine is comparatively new.

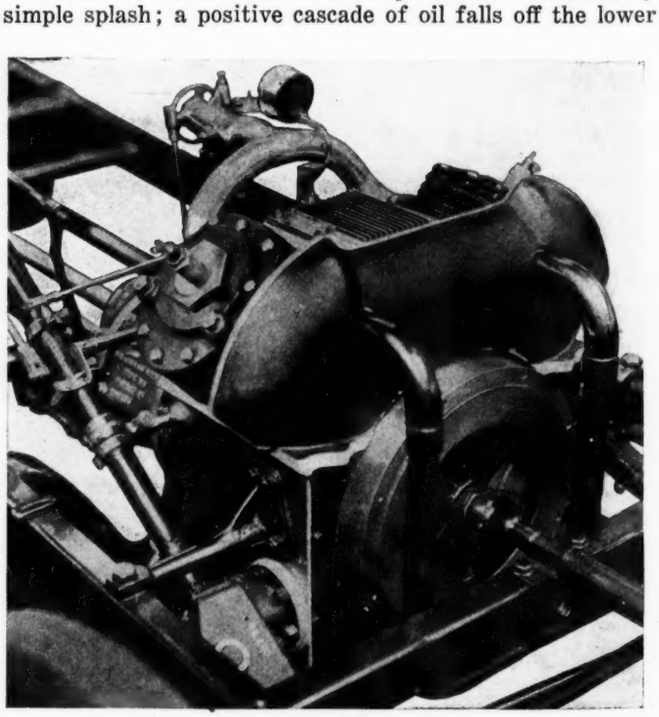
Nor is any very special means provided for preventing oil from working past the piston. The latter is of the usual cast iron straight-sided type and has two compression rings in the crown and a scraper ring in the skirt, the scraper having its upper edge chamfered off so that the oil film on the cylinder wall is but slightly disturbed on the upstroke, though the excess is cleared off on the downstroke. To prevent oil from being drawn up through the inlet valve guides when the engine is running on small throttle, the stem and spring of each inlet valve is guarded by a metal cover. It is the writer's opinion that "oil pumping" in both air and water-cooled engines is primarily due to cylinder distortion.

It will be observed that Bradshaw—differing in this respect from the designer of another oil-cooled engine to be referred to later—does not fit baffle plates to shield the lower ends of the cylinder barrels. He holds that their presence would prevent the efficient and direct cooling of the piston crown. As it is, the large quantity of oil thrown up against the inside of the piston prevents, to a marked extent, the formation of carbon on any part of it, and the crankcase oil in consequence keeps peculiarly free from gritty carbon.

Offhand it might be imagined that oil consumption would be excessive, but with the foregoing in mind it is not surprising to find the reverse is the case. Bradshaw claims that the oil temperature never exceeds 190 deg. Fahr. and under normal running conditions its average temperature is only 150 deg.

He also claims elimination of cylinder and piston distortion, and as a consequence of this and of the shorter time the combustion chamber walls and cylinder head take to reach their normal working temperature, reduced crankcase dilution.

An obvious development is a four-cylinder oil-cooled engine with vertical cylinders in line, and Bradshaw is known to be working on one. Such an engine has actually been built by another engineer. It is a 10-hp. 62 x 90 mm. motor (67 cu. in.). Overhead valves are used in a detachable head, the seats being partially exposed from below to the interior of the crankcase extension, which rises as far as the top of the separate block-cast cylinder barrels. The latter project 5½ in. into the crankcase, clear of the walls of the latter, and are cooled by oil delivered in large quantities upon them from two horizontal perforated pipes, one at each side just below the cylinder head inside the crankcase. The remainder of the parts are lubricated by simple splash; a positive cascade of oil falls off the lower



Front view of Belsize Bradshaw engine showing vaned flywheel and cowling directing air draught on to cylinder heads

ends of the cylinder barrels on to the big-ends and connecting rods, and there are no troughs. In this engine slotted baffle plates shield the lower ends of the cylinder barrels; no scraper ring is fitted to the piston, which has two compression rings only. The oil in circulation passes through a radiator at the front of the chassis, the type used being indistinguishable from a normal tubular radiator for water; but no fan is used for either the radiator or the cylinder heads.

The writer feels assured in foretelling that more will be heard of this system before long. Meanwhile it may be remarked that oil-cooling enthusiasts hold that their optimism was shown justified in the Grand Prix race in France last year, for the reason that Murphy, the winner, on his Duesenberg, ran without water in the cooling system while covering the last two laps, the radiator having been pierced by a stone thrown up by another car.

As to the possible advantages to be derived from oil-cooling, they may be summarized as: more uniform cooling, lack of distortion and compression leakage, more direct cooling of valve seats, lower temperature of lubricating oil and the longer retention by the latter of its original qualities, which together result in more efficient operation.

The system should also enable cost of production to be reduced.

To judge by the experience of the Belsize Co., the oil-cooled system appeals to the user by reason of its having the simplicity and other advantages of air-cooling without the drawbacks of the latter.

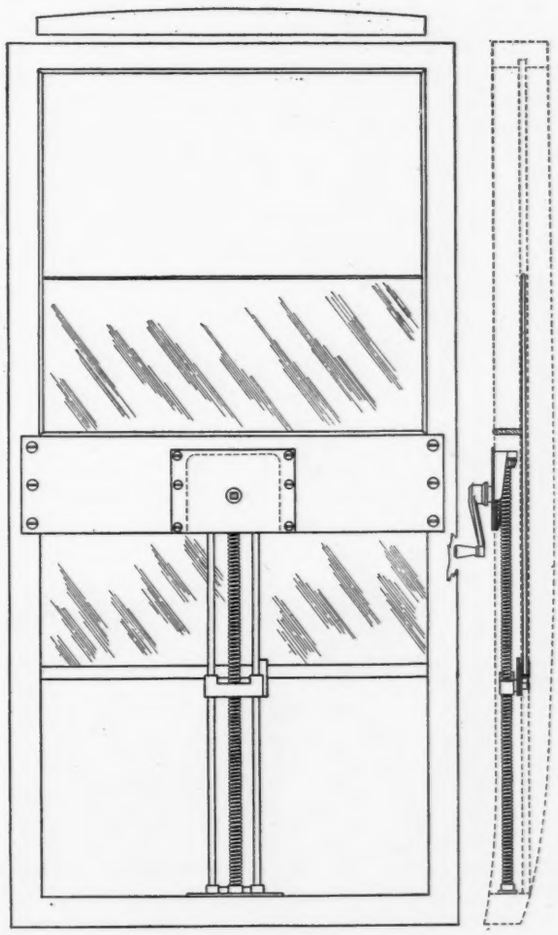
The Simplex Window Regulator

A WINDOW regulating device for use on the doors of closed automobiles is being marketed by the Joseph F. O'Brien Mfg. Co. As may be seen from the illustration herewith, it is of simple construction, and it is claimed that it is easy to install. A square, threaded rod and two guide rods extend from the bottom of the door to slightly above the height of the operating crank on the inside of the door. The two guide rods are secured in brackets at top and bottom, and the threaded rod has bearings in these same brackets, of which the bottom one is fastened to the door frame and the top one to the metal base on which the crank handle is mounted. The shaft of the crank handle is fitted with a bevel gear, which meshes with a bevel pinion at the top end of the threaded rod. Rotation of the threaded rod gives an up-and-down motion to a sliding piece which is fitted to the bottom of the glass channel.

Among the advantages claimed for this regulator are that it has no chains and counterbalances, but is ball bearing and easy to operate. The regulator is claimed to fit any construction and to be free from noise, and the window is said to absolutely stay in position after the hand is taken from the handle.

Another feature of this regulator is that it can be placed in any position on the lock board, either to the extreme right or to the extreme left, as well as in the center, and no additional sets of gears are necessary for the placing of this regulator for the raising or lowering of the quarter lights.

The device for locking the window to the regulator is a new departure. It is not necessary when lights are broken to remove the upholstery. By bringing the glass to the top and forcing over the movable lock which rests just below the molding, the glass can be lifted out without any further difficulty.



Detail of Simplex window regulator

FROM London comes the information that "the development of the passenger-carrying side of motor road transport in 1921 was noticeably rapid and satisfactory from many points of view, and that the movement had assumed considerable proportions by the end of the season may be judged from one instance alone, that the two motor coach stations which were established in Blackpool provided for some 300,000 passengers and accommodated 13,000 coaches.

"Young as this modern form of road travel is, it has already found fairly firm foundations. Novelty has ceased to be an asset. The average person who travels by coach to-day does not do so out of curiosity, but because he has found it to be the most agreeable mode of travel from place to place."

It is claimed that "a good sign for the future of motor coaching is that the demand to go farther afield from the local center is steadily on the increase, even to the extent of tours abroad. This is where light weight in comparison to carrying capacity, relatively high average speed, easy and quiet running, and a good margin of safety in freedom from brake failure, sideslip, and so forth, enter, for they are essential for successful long-distance coaching. The up-to-date small-type vehicle possesses these essentials, and it will be found that by its employment considerable stimulus will be given to the coaching branch of motor road transport in 1922."

An American Development in Large Bore Aircraft Engines

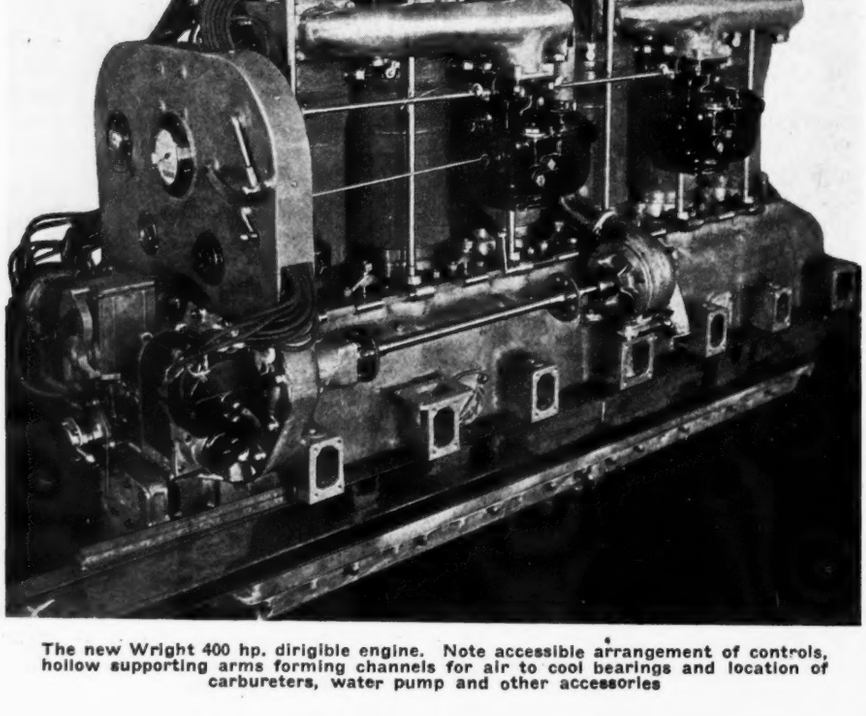
New product of Wright Aeronautical Corporation designed especially for use in ships of the Zeppelin type has cylinders which are probably the largest developed for aircraft use. Similar in some respects to the German Maybach engine, but embodies improvements and develops more power.

By Herbert Chase

A DISTINCTIVELY American development in engines, designed especially for propulsion of lighter than air machines, has recently been completed for the Navy Department by the Wright Aeronautical Corp. This is understood to be the largest heavy duty aircraft engine developed to date. It has six 7 x 8 in. cylinders arranged in line and develops 400 b.hp. at a speed of 1400 r.p.m. This is equivalent to 122 brake m.e.p., an unusual performance for an engine of such large bore. While the speed measured in r.p.m. is lower than is usual in airplane engines, the piston speed, 1867 ft. per min., is by no means low for an engine with so large a piston. The engine weighs 1320 lb. dry, or 3.3 lb. per b.hp. The jackets hold 37 lb. of water. The overall measurements are approximately as follows: Width, 25½ in.; height, 42 in.; length, 75 in.

The design of the engine is such that almost any part can be removed for repairs if necessary while the craft is in the air or without taking the engine out of the gondola in which it is mounted. To realize this condition placed certain restrictions upon the design and made it impossible to employ certain types of construction which are quite general in aircraft engines. It was not feasible, for example, to use an overhead camshaft, since this would interfere with removal of individual cylinders. In other words, accessibility was a controlling factor which made it necessary to add some weight in certain instances. Another requirement which imposed certain restrictions was that the engine be readily convertible from right to left hand rotation without using any more different parts than are absolutely necessary.

In general design, the cylinder resembles that of the Maybach engine, consisting, as it does, of a steel barrel screwed into a cast iron head and having a steel jacket 1/32 in. thick screwed and welded in place. The water space is very narrow. The joint at the base of the jacket is made with a flax packing of triangular section tightened by a ring threaded onto the lower end of the jacket. This joint takes care of the longitudinal expansion of the cylinder barrel. The jacket is machined from two solid forgings, the joint being welded after they are in place.



The new Wright 400 hp. dirigible engine. Note accessible arrangement of controls, hollow supporting arms forming channels for air to cool bearings and location of carbureters, water pump and other accessories

The cylinder heads are flat on the surface which forms the roof of the combustion chamber. The four valves which seat in the head have vertical stems running in long inserted bushings which, besides acting as guides, assist materially in keeping the valves cool. The coring is such as to provide ample water circulating space around all the valves and the full length of the guides without unnecessary restriction of the ports. Water, delivered by the pump through a pipe between the two center cylinders, flows fore and aft across the tops of each set of three cylinders to outlet pipes at each end of the engine, the respective cylinder heads being joined by a short hose connected to flanged nipples bolted to the cylinder heads. The flanges have slots instead of the usual bolt holes, so that the two flanges with their hose connection are easily removed after the nuts on the studs, which carry the flanges, are loosened. This construction facilitates removal of individual cylinders when this is required. Water in the jacket space around the cylinders is circulated by thermo-syphon action

only. Consequently, a drain cock is required at the base of each jacket.

The spark plugs, of which there are four per cylinder, are arranged around the circumference of the combustion chamber approximately 90 deg. apart. Their axes are horizontal and the inner ends of the plugs come just below the roof of the combustion chamber.

The exhaust valves have flat heads of 2 1/16 in. clear diameter and are spaced slightly farther apart than the inlet valves, which have tulip-shaped heads. All valves have hollow stems and are made from high chromium steel. The exhaust valves are mercury cooled. The valves are held to their seats by two concentric helical springs, and are actuated by rocker arms and tubular push rods from two camshafts in the crankcase. The rocker arms for each pair of valves form an integral forging, the central portion of which is tubular and bored out to receive a pair of small Hyatt bearings. The hollow shaft, which passes through these bearings, is fastened in forged supports which are bolted to the cylinder head. One of the fastenings is in the form of a small oil cup through which the entire assembly can be filled with lubricant. The rocker arms are drilled out so that oil is fed to all bearing points, including those on the upper ends of the valves and the push rods. The curved arm which contacts with the push rods is drilled before it is bent. The cup on the end of this arm is made deep enough to prevent the push rod from jumping out while the engine is running, in case a valve sticks in its guide.

The pistons are of cast aluminum and carry four rings at the top and a single oil scraper ring at the base of the skirt. They have a heavy dome-shaped head and straight sides which are given 0.018 in. clearance over their entire bearing surface. The piston alone weighs 9 lb. Its total weight with rings and pin is 13.5 lb. The hollow pin is 1¾ in. in diameter and is arranged to float in both rod and piston. Bronze plugs are pressed into each end. The connecting rods are of the tubular type, drilled from the crank pin end, after which the central oil pipe and the plug which closes the hole in the rod are inserted. The rod is 14 in. long from center to center and weighs 9.3 lb., bolts included. The big end bearings are 3 in. diameter by 3¼ in. long.

The crankshaft is hollow and is provided with removable plugs to facilitate cleaning. All main bearings are 3 in. in diameter. Those at the center and driving end are 3⅞ in. long and the others 2⅞ in. The engine is designed to take the propeller thrust direct or the clutch thrust, a large deep groove annular bearing at the driving end being provided for this purpose. The plain main and big end bearings are of bronze with babbitt linings only 0.018 in. thick.

Oil is fed to each of the main bearings under 50 lb. pressure, and thence to the crank pins and piston pins, also under pressure. The pistons are lubricated by splash from the connecting rods only, the oil which issues from the main bearings being caught by the ledges cast for this purpose on the upper portion of the main bearing supports. This arrangement is said to account for the unusually low oil consumption. In a recent test, the engine is reported to have run for 50 hours with lubricating oil consumption of only 0.008 lb. per b. hp. hr.

The oil pumps, of which there are three, are driven directly off the end of the crankshaft. They are arranged in a neat readily accessible unit, consisting of six gears, an aluminum port plate and cover plate. Two of the pumps draw oil from the front and rear ends of the lower crankcase respectively, and the third delivers the oil from an external reservoir to the bearings through pipes cast in the crankcase. A branch pipe feeds oil to the upper two pairs of timing gears which carry it in turn to the lower gears of the train. The port plate is so designed that it is simply turned over and put back in position when the direction of rotation is changed. The idler gear which meshes with the gear on the crankshaft and the timing gears on the ends of the camshafts also drives a layshaft, which in turn drives a short cross-shaft through a pair of helical gears.

Two two-spark Simms magnetos are driven through flexible couplings, one off each end of the cross shaft. The magnetos can be retarded when starting by turning the handle on the rear end of the layshaft, but automatically shift to the full advance position when this handle is released. Each magneto fires two opposite plugs of each set of four, so that there are four simultaneous sparks in each cylinder. It will be noted that all control elements are centered on or just below the control panel at the rear of the engine, where they are within convenient reach of the operator. Nevertheless, there are certain automatic safety features, one of these being an oil-operated governor. This consists of a spring-loaded

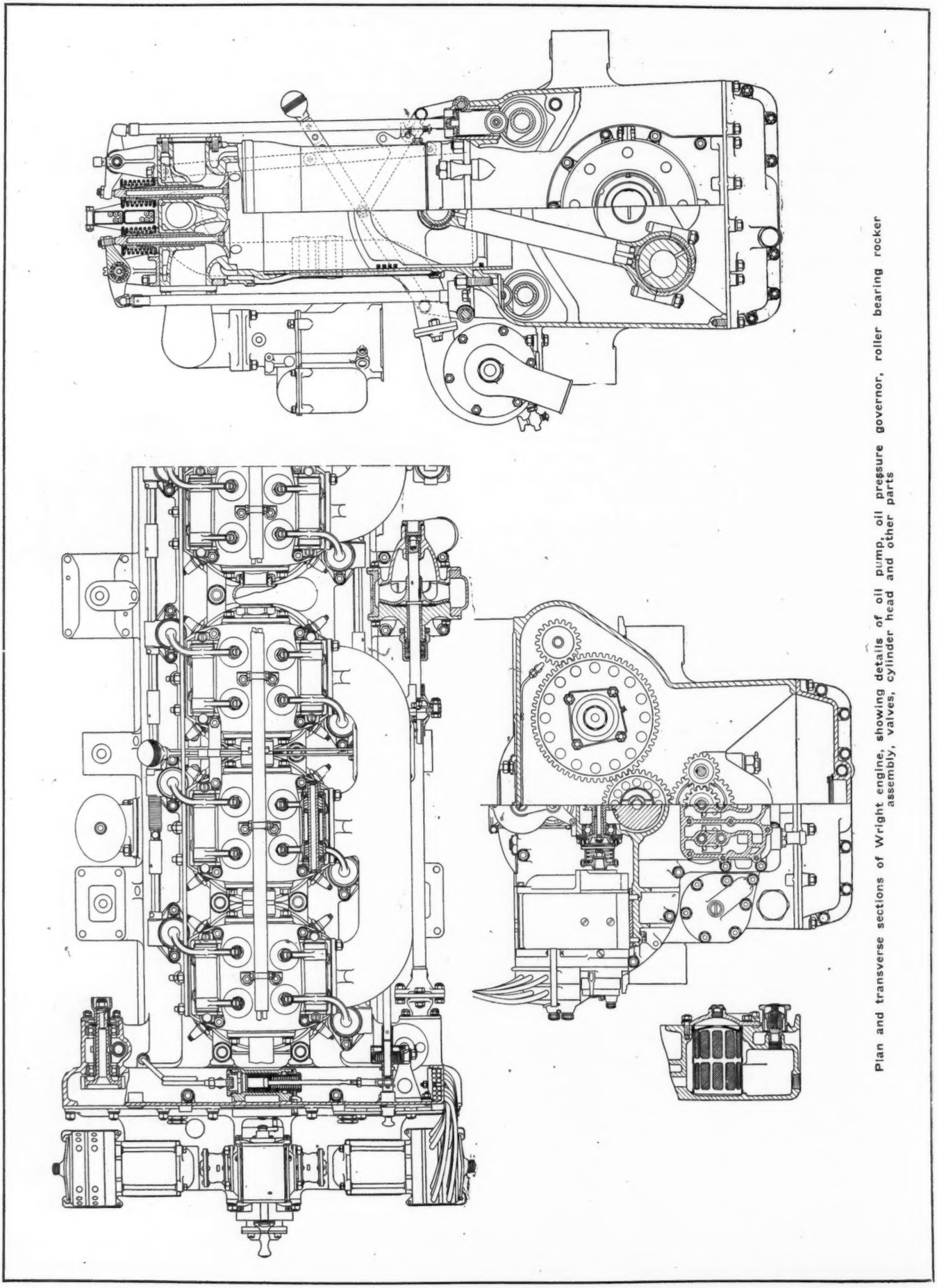
Piston, piston pin and cylinder assembly showing overhead rocker arms, valves, etc.

piston interconnected with the throttle in the manner shown in the drawing. In starting up, the throttle is opened by hand against the pressure of the spring and is held open manually until oil pressure from the pump acting upon the piston and in opposition to the spring is sufficient to hold it open when released by the operator. Should the oil pressure fail or decrease until below a predetermined amount, the throttle is at once returned to an idling position, thus preventing injury to the engine.

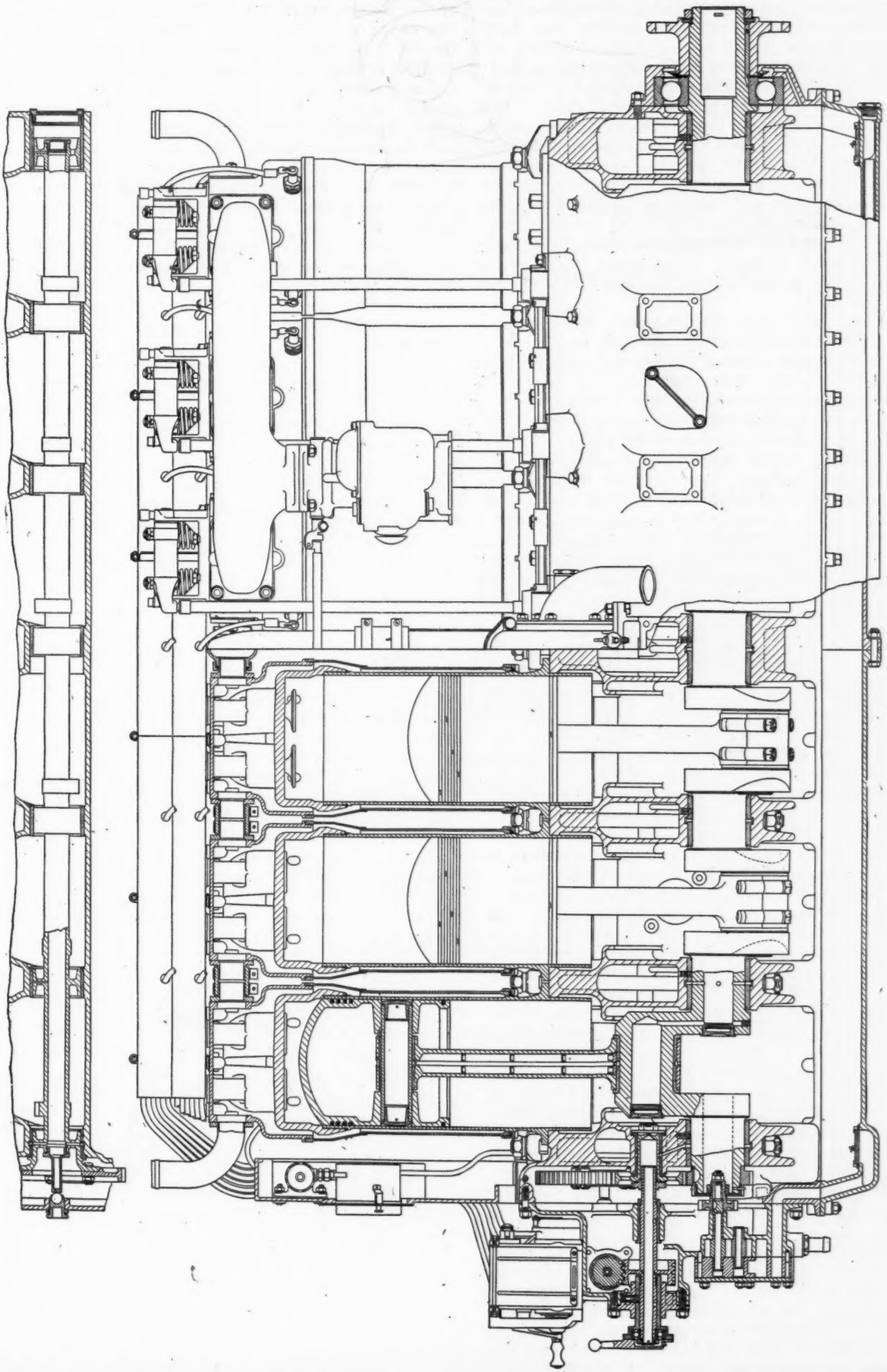
A second governor of the Pierce centrifugal type is provided to prevent overspeeding. This is so arranged as to have no direct effect upon the throttle position, but in case the predetermined speed is exceeded it actuates a pawl, which in turn trips a coiled spring, and the latter closes the throttle to the idling position, where it remains until the spring is reset. Both governors are located just forward of the control panel and can be seen in the plan view of the engine. The throttle shaft projects through the panel and is there attached to the hand throttle lever. The control panel also carries a carbureter control for maintaining a correct mixture with change in altitude, the ignition switch, a combined tachometer and revolution counter, oil pressure gage and a distance thermometer for indicating temperature at some point in the coiling system.

The timing gears have only a ¾ in. face but are amply strong for the loads imposed. The camshafts are hollow and are filled with oil which issues under pressure through small holes to the bearings. The cam follower is a light roller carried in a tubular tappet which is also very light. The head of the tappet is formed with a ball end which fits a cup-shaped recess in the lower end of the pushrod. The tappet guide is carried above the crankcase to prevent overflow of oil.

Special means are required for starting so large an engine, and the system employed is the same as that used on



Plan and transverse sections of Wright engine, showing details of oil pump, oil pressure governor, roller bearing rocker assembly, valves, cylinder head and other parts



Longitudinal section of the Wright dirigible engine, showing type of cylinder construction, piston, connecting rod, crankshaft and other details. Note box-shaped main bearing supports through which air to cool bearings is forced

the Zeppelin Maybach engines. The operation is as follows: All valves are opened by rotating, by means of the hand levers shown in the transverse section, two light shafts which run the length of the engine outside the crankcase and adjacent to the tappets. These shafts carry notched cams which engage the upper edge of a slot cut into the tappet and through which the cams project. The lip on the cam face raises the tappet clear of the cam which normally operates it and in so doing opens the valve. When the valves are open the outlet from the exhaust manifold is closed and a hand pump is employed to draw mixture through the carbureters and induction pipes and into the cylinders. The valves are then closed, the exhaust manifold outlet opened, and the hand magneto, located just back of the control panel is employed to ignite the mixture in the cylinder with piston in firing position. This results in starting the engine.

The main crankcase is a rigid one-piece aluminum casting of box section well reinforced. The bolts which retain the main bearings pass through the bearing supports and the yokes which help hold the cylinders to the crankcase. Additional studs passing through the cylinder flanges serve as the other cylinder fastening means. It will be noted from the longitudinal section of the engine that the transverse ribbing, which supports the main bearings, forms box-shaped passages directly over the bearing. These passages are continued through the supporting arms, as shown in the photograph of the assembled engine, and act as ducts through which air for cooling the bearing and the lubricant can be forced. Piping for conveying this air can be carried outside the gondola and into the slipstream, suitable manifolds being attached to the ends of the hollow supporting arms which are machined and tapped for connecting flanges. The underpan or lower section of the crankcase is made in two pieces to facilitate removal without interference with other parts.

The water pump, as shown in the cut of the assembled engine, is mounted on the central support arm on the inlet side. If desired, it can be placed on the other side, where a similar base is provided. The impeller has straight vanes and will, consequently, operate equally well when rotating in either direction. Base plates, upon which other accessories can be mounted if desired, are cast on other supporting arms as shown in the photograph.

The inlet manifolds are arranged to serve three cylinders each, and two separate 2¾ in. Stromberg carbureters are employed. Compensation for variation in atmospheric pressure with change in altitude is effected by a hand adjustment which controls the pressure on the fuel in the float chambers.

Ignition wires are carried across the top of the engine in Bakelite conduits, located between the two sets of valves, and come down to the magnetos through passages in the instrument board casting.

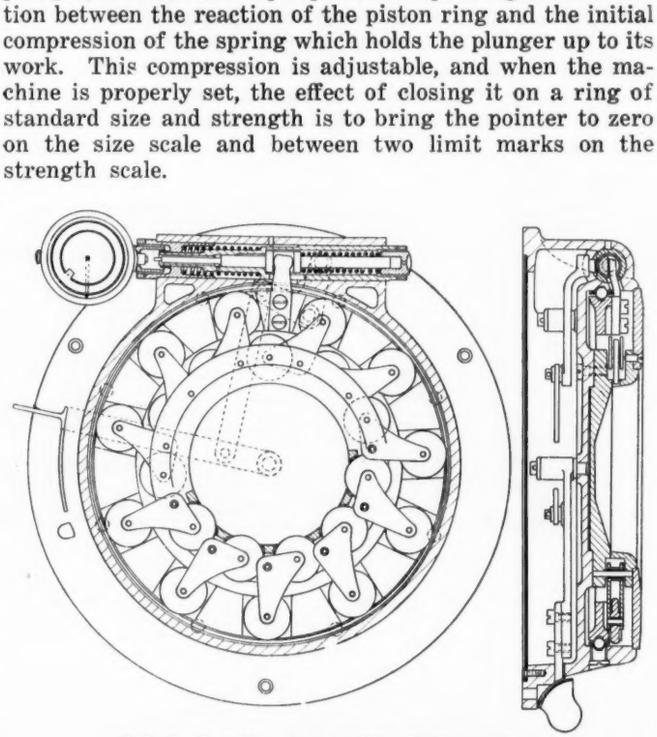
The engine has a 5½ to 1 compression ratio. In a recent Government acceptance test, it is reported to have run for the required period of 40 hours at 1350 r.p.m., developing 350 hp. (throttle partly closed), and 10 hours developing 400 hp. at 1400 r.p.m. The average fuel consumption for the entire 50 hours is given as 0.475 lb. per b. hp. hr., the fuel being a mixture of four parts aviation gasoline to one part benzol.

An Instrument for Testing Piston Rings

THE firm of Adolph Saurer of Arbon, Switzerland, has developed the piston ring testing instrument herewith illustrated. Its object is to determine whether the pressure exerted on the walls of the cylinder when the spring is compressed to its working diameter, is within allowable limits. It is purely a comparator, as it indicates whether the ring being tested has the same characteristics of stiffness as some standard ring known to be satisfactory.

Mounted on ball bearings inside the circular casing is a steel ring having radial slots in its upper face. A number of bell crank levers are pivoted to the casing, and a roller on the outer end of each lever fits into one of the slots in the ring. The other end of each lever also carries a roller which is caused to bear upon the outer circumference of the piston ring to be tested by the rotation of the steel ring already mentioned. The latter ring carries a projecting finger which engages with a plunger situated in a sliding tube. By pressing on a lever which projects from the casing, this tube is caused to move towards the gage shown on the drawing against the action of a spiral spring. The plunger is pressed up against a shoulder in the same direction by a spiral spring within the tube and is therefore carried along with the tube until the resistance to its further motion is sufficient to overcome the compression of the spring acting upon it. This occurs when the finger, carried along by the plunger, has rotated the steel ring sufficiently to cause the rollers to exert a certain pressure on the piston ring.

The gage of the instrument has two concentric dials, the reading of one being due to the motion of the tube and that of the other to the motion of the plunger. To set the instrument, a steel disc of the closed size of the ring to be tested, is inserted, and the lever pressed until the rollers are in contact with it. The dial is then rotated until the pointer stands opposite a zero mark. A piston ring of standard strength is then substituted for the disc and the lever is again pressed. When this ring has been compressed to the standard diameter, the pointer will again point to zero, but before this occurs the inner dial will have been actuated by the differential motion of the plunger, and will take up a position depending on the relation between the reaction of the piston ring and the initial compression of the spring which holds the plunger up to its work. This compression is adjustable, and when the machine is properly set, the effect of closing it on a ring of standard size and strength is to bring the pointer to zero on the size scale and between two limit marks on the strength scale.



Detail of piston ring testing instrument

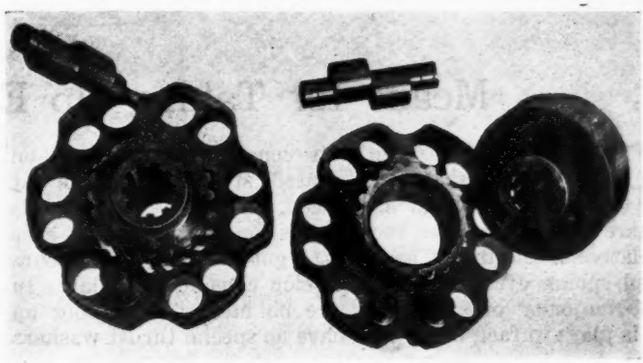
A New Type of Compensating Differential

The design is such that maximum differential action occurs at low axle speeds and the resistance increases with the speed. As compensation is made for variation in tractive ability, it is not a positive locking type.

A COMPENSATING differential has been placed on the market which utilizes the effects produced by fluid friction and is so designed that the maximum differential action takes place at low axle speeds. The resistance provided by the construction—which is not complicated—increases as the speed increases, tending to reduce the differential action at high speeds. The principles involved are apparent upon an examination of the construction.

This differential consists structurally of an outer case similar to that of an ordinary bevel gear differential, to which the power from the engine is transmitted in the usual way. It is of such general dimensions as to permit its installation in the average axle without alteration. Power from the engine is transmitted to the case, on which is mounted the conventional master gear. From the case it is transmitted through double eccentric rollers to two central driving plates provided with suitable holes for journaling these rollers. The two driving plates also constitute an external and internal gear, respectively, which mesh with mating external and internal gears fastened to the two axle drive shaft sections, respectively. The arrangement is such that the driving plate external-internal gear unit can swing around the axis of the double eccentric rollers when actuated to do so by the gears on the axle drive shaft sections.

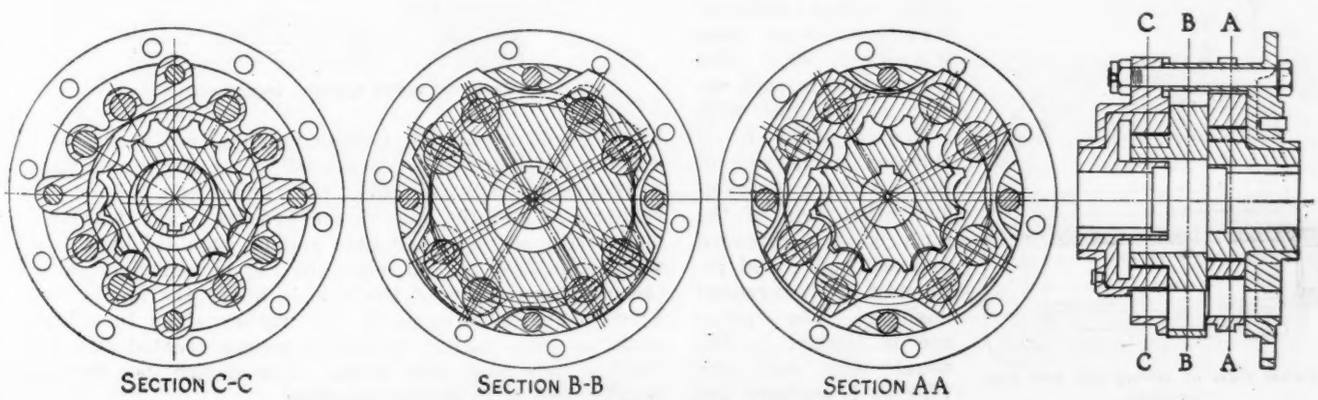
The double eccentric gearset forms a reverse motion as required in a differential. When motion in the differential is induced, as in turning corners, the internal gear on the end of one axle shaft and the external gear on the other axle shaft turn in opposite directions. The compensating action of the two gear plates between the two shaft gears consists in a swinging gyratory motion around the centers of the supporting rollers. This gyratory motion causes the rollers to rotate on their axes at a much greater rate than the shaft gear, the ratio on the Ford installation being 12 to 1. The degree of resistance offered can be varied by changing the ratio through the medium of a change in the eccentrics. The rollers being numerous and having comparatively large areas, when running in oil, offer considerable resistance to acceleration of speed. At the low speed of differential action the resistance to turning is low, but when the driving forces tend toward higher differential action abnormal resistance at an increasing rate is inserted, following the law of frictional resistance.



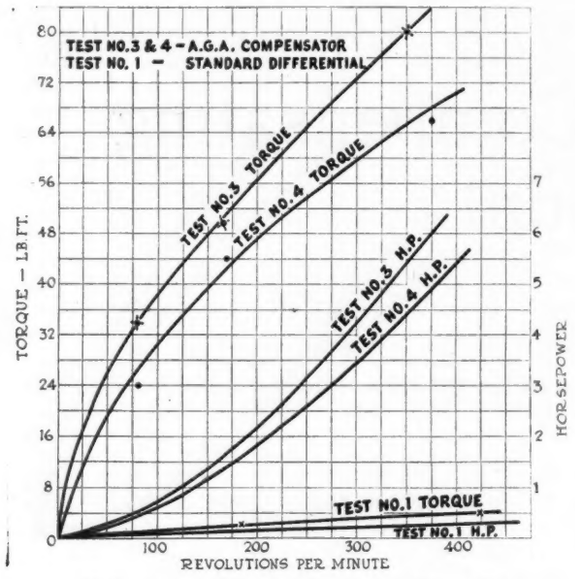
Parts of Ford type Krohn differential

In actual operation, when one of the wheels is off the ground momentarily or on a slippery spot, and differential action is induced by a difference in tractive ability, the tendency to accelerate this wheel is opposed by the internal resistance in the differential mechanism. It will be seen that it is not a positive locking differential but one in which some compensation is made for variation in tractive ability.

The Krohn differential is now being supplied by the H. McFarlane Co. of Chicago as a replacement for the



Sectional views of Ford type Krohn differential



Test curves of Ford type Krohn differential

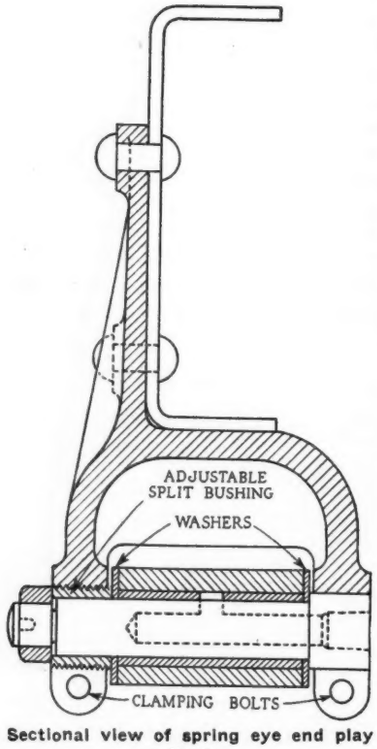
regular Ford differential, but the device is being built in several sizes for truck and passenger car installation. A test on a prony brake to determine the amount of power being delivered to the free or semi-free driving wheel was made and the graph shown represents the results of this test.

The tests referred to were based on the following reasoning: If an ideal compensator could be made, a car equipped with it could pass over otherwise impassable ground without noticeable interruption in its motion, provided that road conditions were not such that both wheels lost traction at the same time, when no amount of power applied to the driving wheels would pull the car out. A spinning wheel always has a slight amount of tractive effort, and in the Krohn compensator this reacts to increase the pressure of the rollers on their bearings. How much this actually benefits the action of the Krohn differential it is impossible to accurately determine in a block test such as that described here.

Tests Nos. 3 and 4 give relative values which tend to establish the assumption as correct. The curves of test No. 3 show the difference between the two scale readings and consequently, measure only the internal resistance of the compensator. In the standard bevel gear differential none of these conditions seem to apply, and this test was run with one wheel entirely free. The graph shows the torque curves obtained, as well as the hp. curves computed from the torque values.

Means for Taking Up End Play of Spring Eyes

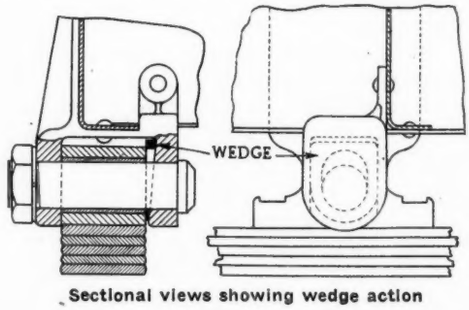
CENTRIFUGAL force puts considerable pressure on the thrust washers of chassis springs when the car is turning a corner at any speed, and as on rough roads there is a continuous rocking motion of the spring eyes relative to the thrust bearings, a good deal of wear occurs and spring eyes eventually develop considerable play. In the majority of cars there are no means for taking up this play; in fact, many cars have no special thrust washers on the spring bolts, and the result is that in time the car rattles.



Sectional view of spring eye end play adjuster

A. C. Schulz, who was formerly connected with the engineering department of the Locomobile Co. and about a year ago brought out the Navarre car, has invented a means for readily adjusting the spring bolts to take up the end play. Two different designs have been worked out. The spring bolt in each design is provided with a head which is clamped in one arm of the spring bracket. The other arm of the bracket is threaded and also split, and receives a split, threaded bushing. The spring eye is bushed in the usual way and two thrust washers are threaded over the bolt, one resting against the bolt head and the other against the split bushing. End play is taken up by adjusting the bushing, which is then locked in position by clamping the split yoke arm upon it. In one of the designs the spring bolt is provided with a nut, while in the other the bolt is held solely by clamping in the arms of the spring bracket. This latter is intended especially for front spring horns, where projections are objectionable.

A SIMPLE means for taking up wear at the ends of spring eyes and the inner side of the lugs of spring brackets has been invented by Hugo Gibson. It is well known that such looseness is the cause of annoying rattle in many old cars. Mr. Gibson finishes the inner side of one lug of the spring bracket off at an angle and places a wedge-shaped washer over the spring bolt between the spring eye and the lug of the bracket. The washer is made with an elongated hole and of such thickness that when it is first put on when the car is assembled, all of the clearance space of the hole is above the spring bolt. Then, as wear takes place, the washer sinks to a lower position, thus taking up the looseness created and preventing side play and rattle. The device can be used equally well with spring shackles.



Sectional views showing wedge action

Rear Wheel Dynamometer Tests and Their Significance to the Engineer

A description of the car testing apparatus installed at the Sheffield Scientific School and the methods followed in its use. Results of tests of various cars with this equipment furnish much information regarding performance under road conditions which is worthy of careful study.

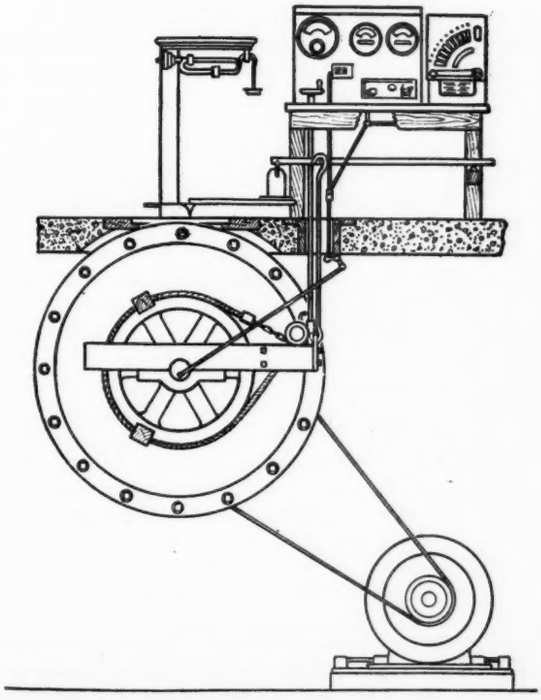
By Herbert Chase

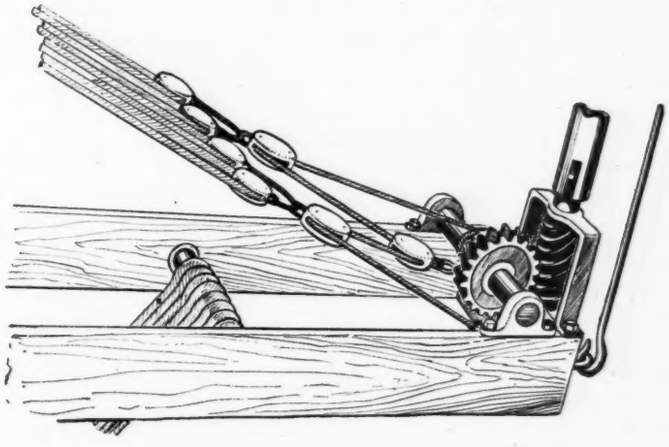
REAR-WHEEL testing dynamometers are not a new thing in the automotive industry, but it is surprising how few data regarding tests made with them have been published and how small a part of the information in this regard which does exist has resulted from tests made under conditions which approximate normal running on the road. As an illustration of the general lack of information along this line, it may be said that few engineers realize that it requires less than 3 hp. exerted at the rim of the driving wheels to propel most passenger cars on a hard level road at a speed of 20 m.p.h., and that, under these conditions the engine is required to develop seldom more than 6 hp. and often less than 5 hp. It seems safe to say that, were these facts and others of a closely related nature fully appreciated, more attention would be given to securing better economy at low loads and less to maximum load performance, a condition which is encountered so small a part of the time under normal operation.

With these facts in mind, let us first consider the simple apparatus required for rear-wheel testing, and then examine the methods employed and some of the results obtained by the use of such equipment in the Mason Laboratory at Sheffield Scientific School, Yale University. The dynamometer in question is in direct charge of Prof. E. H. Lockwood, who is responsible not only for the design of most of the equipment, but for the logical, if somewhat unusual, methods followed in making the tests here recorded.

The accompanying cuts give an excellent idea of the important elements of the testing equipment. A pair of paper pulleys measuring about 5 ft. 8 in. in diameter are mounted upon a heavy shaft carried in a pair of hangers with plain ring-oiled bearings. The hangers are so arranged that the face of the drums comes approximately flush with the floor on which the car to be tested is located. The drums upon which the car wheels rest have a 15-in. face and the circumference is such that the drums make precisely 300 revolutions per mile of travel of a point on the circumference. Being about twice the diameter of the average tire, the surface of contact with the tire is only slightly convex, and consequently it closely approximates a hard, smooth road surface. The compressed paper also affords good traction for rubber tires.

Overhung on one end of the drum shaft is a cast iron brake pulley 36 in. in diameter by 8 in. face. This pulley has flanges facing inward and thus forming a channel

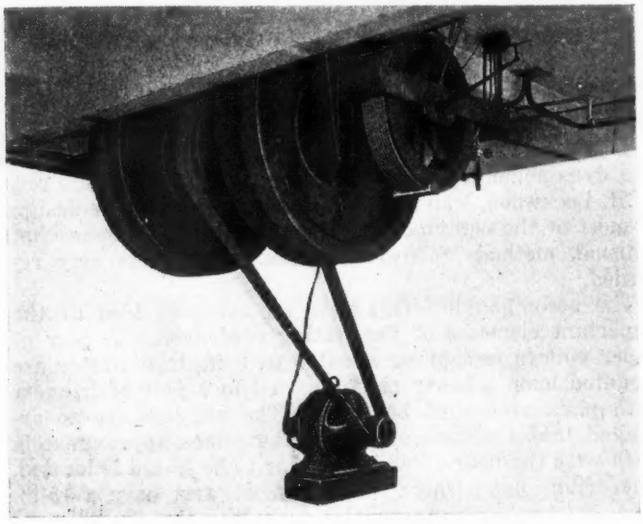




Left, diagrammatic view of the rear wheel dynamometer, showing rope type prony brake, drums, weighing and recording equipment, etc.

Above, detail sketch of the mechanism used for tightening the rope on the prony brake and thereby varying the load. The worm shaft is free to move vertically in the slotted sleeve which is connected to the hand wheel shaft on the control table seen in the diagram at the left.

which can be kept partly filled with water, the evaporation of which prevents the braking surface from becoming overheated. On this surface bear eight parallel bands of ¾-in. rope arranged in the manner shown in the accompanying cut. It will be noted that the ends of each of the four rope slings are attached to a bar carried between the side members of a box-shaped brake arm, while the loops are carried on four small pulleys attached to a small block and fall. One end of the light cable used in the block and fall is attached to the brake arm, while the other end passes around the horizontal shaft of a small worm wheel carried on the brake arm. The shaft of the meshing worm is vertical and carries a pin, the ends of which can move



View of the paper dynamometer drums suspended from hangers underneath floor of testing room. Note prony brake and motor used in driving drums when making measurements of rolling friction.

vertically without restraint in a slotted sleeve carried on the lower end of a shaft which projects upward through the floor to a control wheel on the floor above. Turning the hand wheel varies the pull on the cable of the block and fall, and thus tightens or loosens the rope slings with corresponding variation in the load imposed upon the brake. The pulley system of the block and fall serves to equalize the pull on the rope slings and assists in giving a smooth and easily operated brake. The wooden blocks shown on the brake surface are grooved to receive the rope strands, and act only as separators.

The slotted sleeve does not interfere with free motion of the brake arm, the pull on which is measured on a platform scales through the linkage shown, due allowance being made for tare.

Between the two drums and mounted upon the same shaft is a second pulley to which is belted a 15-hp. variable speed electric motor which is capable of driving the drums at any speed from 20 to 40 m.p.h. By its use it is possible to determine readily the rolling friction of both the front and rear wheels of the car. An electric tachometer driven off the drum shaft is used to make approximate speed readings, these being checked by means of a positively driven revolution counter and a stop-watch.

Fuel consumption is measured by determining the difference in weight of a tank containing the fuel at the beginning and end of runs. This tank rests on sensitive scales which are kept balanced while adjustments for the run are being made. When the scale beam falls it closes an electric contact which rings a bell and, through a system of magnets, starts the stop-watch and the revolution counter. The counterweight on the fuel scales is then reset to indicate a certain decrease in weight, usually four to six ounces. When the beam again falls, showing that the amount of fuel in question has been used, the electric circuit is again closed and the stop-watch and revolution counter are automatically stopped. This gives positive and simultaneous measurements of time, fuel consumption and revolutions of the drums, from which readings the speed and rate of fuel consumption are readily figured. The fuel tank is connected to the carbureter by flexible rubber tubing which does not interfere with weight measurement.

Very few cars have sufficient radiation and fan capacity to dissipate all the heat which is absorbed by the jacket water when the engine is operating under full load. It is therefore customary to connect to the radiator drain cock a rubber tube through which cold water from the street mains is mixed with hot water at the base of the radiator in sufficient quantity to prevent boiling of water leaving the engine jacket. It is thus possible to operate the engine with a fairly high jacket temperature but without danger from overheating.

How Tests Are Conducted

The object of the average test made with the apparatus described is to determine the power and economy of the car as a whole, as well as that of the engine under various loads including maximum load and at various speeds. By proper use of the measurements secured in making these tests it is possible to predict within close limits the performance of the car on the road, in particular to learn its rolling resistance and the amount of excess power available for acceleration and hill climbing. Perhaps the most interesting and enlightening tests of all are those made to determine rolling resistance, since it is these measurements, taken together with the computed wind resistance, which determine what load is to be imposed to duplicate the condition of driving on a level road at the various speeds to be considered.

The procedure is as follows:

The front wheels of the car are first placed on the drums and the back wheels are blocked to prevent any fore-and-aft motion. The tires are inflated to the pressure recommended by the tire manufacturer for the size and type of tire in question and this pressure is recorded. The band of the prony brake is slackened so that it is held in contact with the drums only by its own weight. The electric motor which drives the car drums is then started and the drums are turned successively at speeds of 10, 20, 30 and 40 m.p.h. At each speed the r.p.m., brake scale reading and the electrical power input to the motor, as indicated by readings of the voltmeter and ammeter, are noted. The car is then removed from the drums, and the same test repeated, except that the brake band is tightened to give precisely the same volt and ammeter readings as before at the same speed. The increase in the brake scale reading thus becomes a precise measure of the rolling friction of the front wheels, all question as to the efficiency of the electric motor and its belt drive being automatically eliminated so far as results are concerned.

Following this test, the rolling friction of the rear wheels is measured in precisely the same way, this test being made with the change gears in neutral position. The rolling friction of the rear wheels includes, of course, the friction of the reduction gears in the axle housing and that of the propeller shaft and its joints, and the primary shaft of the gearset. It is realized that the friction thus measured is not necessarily the same as that when the parts involved are driving under load, but the difference is probably small, especially at light loads.

Adding the rolling friction of the front wheels to that of the rear wheels and their connecting elements gives, approximately, the total rolling resistance of the car. If

to this be added the wind resistance, we have a measure of the total resistance to motion of the car on a hard, level road or the drawbar pull required to tow the car at the several speeds in question. For the purposes of the test the projected frontal area of the car in square feet is measured and this is multiplied by 0.003 times the square of the speed to give the total wind resistance.

The tractive effort, or reaction of the driving wheels against the ground at uniform speed on a level road must, of course, just equal the rolling resistance of the front wheels, plus the wind resistance at that speed. These factors having been determined from the tests and computations already described, it is an easy matter to make a test substantially duplicating road conditions by simply applying to the car the equivalent brake load. To do this the car is placed with its driving wheels on the drums and is anchored by chains attached to the rear axle and fastened to a horizontal shaft parallel to the rear axle of the car and about the same height above the floor to which it is firmly secured. The front wheels are again blocked and tests made at 10, 20, 30 and 40 m.p.h. as before. There are two tests at each speed, one with a load setting corresponding to level road resistance, and the other at wide open throttle. The difference in power developed as between these two load conditions is, of course, the power available for acceleration or hill climbing. Knowing this power, it is a simple matter to compute the maximum grade which the car can climb in high gear at the particular speed, or its ability to accelerate.

Adding the power developed at the rear wheels to the friction horsepower as computed from the rolling resistance of the rear wheels, already measured, we have the approximate brake horsepower of the engine. Knowing this and the rate of fuel consumption in each of the power tests referred to, the brake m.e.p., fuel consumption per b.hp. and the other data given in Table I are readily deduced.

A Study of the Test Results

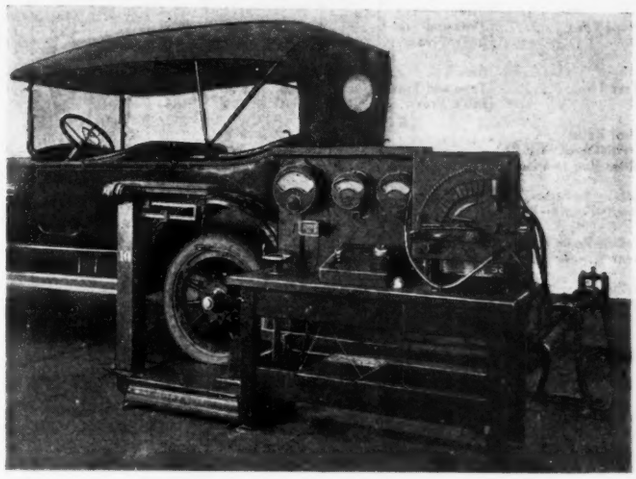
A study of the results of a number of the tests made during the last five years reveals many highly interesting facts which are worthy of study. During this period, upward of 100 cars and a number of trucks have been tested. From these tests some 20 covering a number of representative cars and trucks of various sizes and in various price classes have been selected for tabulation and comparison here. No special effort was made to select test data which reflected particularly meritorious performance, but the data given are thought to be, in general, fairly representative of average performance. In most cases the cars tested were not especially tuned up for the test, but were brought to the laboratory and tested without readjustment, in the same condition under which they were being used by owners. For this reason the tests are not to be regarded, at least in most cases, as indicative of the best performance possible, but rather of a general average performance encountered in normal service.

It will be noted that the cars to which the data applies are not of the same age and have not been operated the same number of miles. The price classification is only approximate and refers rather to the present prices of the same or equivalent chassis than to the price in the year when the car was manufactured. Thus, if a car purchased in 1918 cost $2,500 and the same or an equivalent new chassis now sells for $1,900, that car is placed in the $1,500 to $2,000 class. The price classification refers also to the open phæton, usually the five-passenger model, even though the particular chassis tested was fitted with a more expensive closed body. The weight given is, however, the actual weight of the car as tested.

Only a few of the possible comparisons which can be made will be discussed here, since it is evident that various readers will be interested from different angles, but it will be found that the figures are worthy of careful study as an index of general everyday performance.

Rolling Friction

The rolling friction of front wheels is made up of three elements which are not easily separated. They are the friction of the tire itself, friction of the bearings and windage of the wheel turning in the air. Frictional losses in the tire are encountered because of the kneading of the fabric and the rubber as successive sections pass between the wheel and the road. If the casings were perfectly elastic these losses would not occur, that is, the work done in compressing the casing material would all be given back



Car in position for test on the dynamometer. The rear axle of the car is connected by chains to the shaft seen in back of the control table. The chains prevent the car from moving forward.

when the tire again assumes its normal shape. No solid materials are perfectly elastic, and even the best grades of rubber and fabric are a long way from being so, consequently there is a material loss in internal friction which, of course, manifests itself in heat. This frictional loss is much the greatest of the three front wheel losses, the other two being practically negligible at ordinary speeds. Tire losses increase with the load upon the tire and with decrease in inflation pressure, due presumably to the greater deformation under both of these conditions.

It is interesting to note that the rolling friction of a fabric tire is about 50 per cent greater than that of the same size cord tire. This is shown clearly by reference to the results given in the table under the head of rolling resistance of front wheels. Take, for example, cars F and G, which weigh about the same and have the same size of tires inflated to the same pressure, but F having the cord and G fabric tires. The respective rolling resistance is 20.4 and 31 lb. The rolling resistance of front tires is substantially the same in most cases at 20 and at 40 m.p.h., that is, the rolling friction is practically independent of speed, but, of course, the power loss increases directly as the speed. It amounts, in the cases cited, to 1.08 and 1.66 hp. respectively at 20 m.p.h. and to double this at 40 m.p.h. for both front wheels.

The highest front wheel resistance recorded for pneumatic tires is 38 lb. for 36 x 4½-in. cord tires carrying 2565 lb. This is equivalent to 30.2 lb. per ton. The lowest resistance for a pair of front wheels is 17 lb., the tires in this case being 34 x 4-in. cords carrying 1575 lb. or 21.6 lb. per ton.

The rolling resistance of the rear wheels, which, as explained, included the friction of axle bearings and reduc-

Table 1—Results of Rear Wheel Dynamom

CLASS	Speed M.P.H.	Under $600		$600 to $1000		$1000 to $1500			$1500 to $2000			$2000 to $3000		Over $3000					
Car		A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R
Year—Model		1918	1921	1915	.....	1916	1922	1920	1921	.....	1916	1923	1916	1918	1921	1917	1920	1920	1916
No. of Cylinders		4	4	4	4	4	4	6	6	8	6	6	8	8	12	6	4	6	6
Bore and Stroke—Inches		3¾x4	3 11/16x4	3 7/8x4½	3 5/8x4½	3¾x5½	3 5/8x4½	3 5/8x4½	3 7/8x5	2 7/8x4¾	3½x5	3½x4	3¼x5	3½x5⅛	3x5	3¾x5⅛	3¾x6¾	4½x5½	4½x6½
Piston Displacement—Cu. Ins.		177	171	212	186	243	185.8	241.6	353.8	247	288	199	332	314	424	340	298	525	585
H.P. Rating		22.5	21.8	24.03	21	22.0	21	27.3	36	26.5	29.4	25.4	33.8	31.25	43.2	33.7	22.5	48.6	45.7
Wheel Base—Inches		100	102	108	109	119	118	118	126	120	123	116	125	125	135	136	132	142	143.5
Weight Lbs. on Wheels—Front		860	1050	1190	990	1575	1390	1440	1600	1510	1560	1380	.....	2000	2250	1800	1825	2300	2565
Weight Lbs. on Wheels—Rear		945	1200	1310	1120	1815	1610	1475	1800	1730	1660	1660	.....	2300	2585	2000	2235	3000	2615
Weight Lbs. on Wheels—Total		1805[1]	2250[1]	2500	2110	3390	3000	2915	3400	3240	3220	3040[1]	3675	4390	4835	3800	4060	5300	5180
Front Tires—Size		30x3½	31x4	33x4	30x3½	34x4	33x4	33x4	33x4½	34x4½	34x4	32x4	34x4	35x5	35x5	34x4½	32x4½	35x5	36x4½
Front Tires—Type and Tread		F-N	F-S	F-N	F-S	C-R	C-R	F-S	C-S	F-N	-N	C-R	.....	C-N	C-R	C-R	C-N	C-N	C-N
Front Tires—Infl'n Press.		60	70	60	65	60	65	65	65	70	80	60	65	60	60	55	45	80	80
Rear Tires—Size		30x3½	31x4	33x4	30x3½	34x4	33x4	33x4	33x4½	34x4½	34x4	32x4	34x4	35x5	35x5	34x4½	32x4½	35x5	37x5
Rear Tires—Type and Tread		F-N	F-N	C-N	F-N	C-R	C-N	F-N	C-N	F-N	-N	C-N	C-N	C-N	C-N	C-R	C-N	C-N	C-N
Rear Tires—Infl'n Press.		60	70	65	70	60	65	65	65	70	80	60	65	60	65	60	65	80	90
Gear Ratio		3.63	3.67	3.62	3.55	4.0	5.0	4.0	3.7	4.92	4.08	4.33	4.9	5.2	4.36	3.69	3.62	3.52	3.12
Frontal Area—Sq. Ft.		21.6[1]	24.[1]	20.4	16.	21.2	27.	21.2	21.3	18.	22.0	28.0[1]	22.5	25.	25.	20.	18.3	23.0	32.5
Miles Run to Date		5,000	300	50,000	1,050	34,000	4,800	3,500	10,700	.....	9,260	500	35,000	7,800	10,100	12,000	8,500	15,000	20,000
Rolling Resistance Front Wheels—Lbs.	20	20.4	27	31	20	17	20.4	31	17.3	32	35	21.6	34	30.5	28	27.	27.2	35	38
	40	20.4	.....	32	20	17	20.4	31	17.3	32	35	21.6	34	33.5	30	28.5	27.2	35	8
Rolling Resistance Rear Wheels—Lbs.	20	54.9[4]	34	33	25	34	28	44	44.4	52	46	32.5	34	56.5	57	40.5	61.0	79	47.5
	40	54.9	.....	35	27	34	35	44	44.4	54	48	35.5	34	57.5	57	40.5	61.0	79	50.0
Rolling Resistance Complete Car—Lbs.	20	75.3[4]	61	64	45	51	48.4	75	61.7	84	81	55.1	68	87	85	68.5	88.2	114	85.5
	40	75.3	.....	67	47	51	55.4	75	61.7	86	83	57.1	68	91	87	69.0	88.2	114	88.0
Wind Resistance, Various Speeds, Lbs.	10	6.5	7	6.0	4.8	6	8.1	6.4	6.4	5.4	7	8.4	6.7	7.5	7.5	6.0	.....	6.9	9.75
	20	26.0	29	24	17.2	25	32.4	25.6	25.6	21.6	26	33.6	27	30.5	30.5	24	22	27.6	39.0
	30	58.5	65	55	47	57	72.9	57.6	57.6	48.6	59	75.6	60	67.5	67.5	55	49.5	62.1	88.0
	40	104.0	.....	96	77	102	129.6	102.8	102.8	86.4	105	134.4	108	120	120	96	88.0	110.4	156
Tractive Effort, Level Road, Lbs.	10	26.9	34	37	24.8	23	28.5	37.4	24	37.4	42	30.0	40.7	36.5	34.5	33	.....	41.9	48
	20	46.4	56	55	37.2	42	52.8	56.6	43	53.6	61	55.2	61	61	58	51.5	49.2	62.6	77
	30	78.9	92	86	67	74	93.3	88.6	75	80.6	94	97.2	94	100	96.5	83	76.7	97.1	126
	40	124.4	.....	128	97	119	150.0	133.8	12·	118.4	140	156.0	142	153.5	150	124.5	115.2	145.4	194
Maximum Tractive Effort Direct Drive—Lbs.	10	161	.....	202	232	305	290	356	380	412	413	267	.....	580	584	430	.....	.....	.....
	20	198	224	239	263	334	282	250	368	375	418	272	462	577	619	480	359	.....	653
	30	174	194	252	222	310	276	310	369	353	418	224	450	565	621	470	341	695	650
	40	124	.....	247	175	260	218	270	327	272	376	180	340	540	537	432	330	612	610
Maximum Grade Direct Drive—Per Cent.	10	6 9	.....	6.2	8.8	7.7	8.3	10.4	10	11.0	11.0	7.8	.....	12.0	11.0	10.0	.....	.....	.....
	20	7.8	7.0	6.9	9.8	7.9	7.3	9.6	9.2	9.4	10.6	6.8	10.4	11.3	11.3	10.8	7.4	.....	10.6
	30	4.9	4.2	6.3	6.8	6.4	5.8	7.2	8.3	7.5	9.6	4.2	9.3	10.1	10.5	9.8	6.3	11.0	9.7
	40	.....	.....	4.5	3.5	3.8	2.2	4.4	5.8	4.5	7.0	0.8	5.1	8.3	7.8	7.7	5.1	8.6	7.7
Rear Wheel H.P. Level Road	10	0.72	0.92	0.99	.....	0.61	0.76	1.0	0.63	1.0	1.12	0.8	1.1	0.97	0.92	0.88	.....	1.12	1.28
	20	2.48	2.99	2.93	.....	2.24	2.82	3.02	2.29	2.86	3.25	2.94	3.5	3.26	3.09	2.75	2.62	3.34	4.03
	30	6.32	7.36	6.88	.....	6.00	7.46	7.09	5.99	6.55	7.50	7.76	7.5	8.0	7.72	6.64	6.13	7.75	9.95
	40	13.29	.....	13.65	10.38	12.71	16.0	14.27	12.75	12.6	15.0	16.6	15.2	16.4	16.0	13.27	12.28	15.51	20.5
Rear Wheel H.P. Maximum Developed	10	4.3	.....	5.4	6.21	8.1	7.7	9.5	10.17	11.0	11.0	7.1	.....	15.45	15.6	11.47	.....	.....	.....
	20	10.6	12.0	12.8	14.13	17.8	15.1	18.7	19.60	20.0	22.2	14.5	24.7	30.8	33.0	25.60	19.1	.....	34.8
	30	13.9	15.5	20.2	17.78	24.8	22.1	24.8	29.60	26.8	33.4	17.9	36.0	45.0	49.7	37.60	27.3	55.6	52.1
	40	13.29	.....	26.4	18.65	27.7	23.3	28.8	34.90	29.0	40.1	19.2	36.3	57.5	57.2	46.1	35.2	65.2	65.0
H.P. Lost—Transmission and Rear Tires	10	1.47	0.91	0.88	0.64	0.91	0.69	1.17	1.17	1.36	1.23	0.87	0.91	1.49	1.52	1.08	.....	2.11	1.23
	20	2.93	1.81	1.76	1.34	1.81	1.49	2.35	2.34	2.77	2.45	1.79	1.81	3.02	3.04	2.16	3.26	4.21	2.60
	30	4.40	2.72	2.72	2.08	2.72	2.40	3.52	3.50	4.24	3.75	2.76	2.72	4.56	4.56	3.24	4.88	6.32	3.91
	40	5.86	.....	3.74	2.89	3.63	3.74	4.69	4.68	5.76	5.12	3.78	3.62	6.11	6.08	4.32	6.51	8.42	5.34
Brake H.P. Required Level Road	10	2.19	1.83	1.87	.....	1.52	1.45	2.17	1.80	2.36	2.35	1.67	2.01	2.46	2.44	1.96	.....	3.23	2.51
	20	5.41	4.80	4.69	.....	4.05	4.31	5.37	4.63	5.63	5.70	4.73	5.31	6.28	6.13	4.91	5.88	7.55	6.63
	30	10.72	10.08	9.60	.....	8.72	9.86	10.61	9.51	10.79	11.25	10.52	10.22	12.56	12.28	9.88	11.01	14.08	13.86
	40	19.15	.....	17.39	13.27	16.34	19.74	18.96	17.43	18.36	20.12	20.38	18.82	22.46	22.08	17.59	18.79	23.93	25.84
Brake H.P. Maximum Developed	10	5.8	.....	6.3	6.85	9.0	8.4	10.7	11.27	12.36	12.23	7.97	.....	16.94	17.1	12.55	.....	.....	.....
	20	13.5	13.8	14.6	15.47	19.6	16.6	21.1	21.94	22.77	24.65	16.29	26.51	33.82	36.0	27.76	22.4	.....	37.4
	30	18.3	18.2	22.9	19.86	27.5	24.5	28.3	33.12	31.04	37.15	20.66	38.72	49.56	54.3	40.84	32.2	61.9	56.0
	40	19.15	.....	30.1	21.54	31.4	27.0	33.5	39.58	34.76	45.22	72.98	39.92	63.61	63.3	50.42	41.7	73.6	70.3
Brake M.E.P. at Maximum Load	10	64	.....	64	73	74	73	86	67	82	83	74.2	.....	85	82	78	.....	.....	.....
	20	74	81	74	83	81	72	85	65	76	84	75.8	65.2	85	86	86	67	.....	89
	30	67	72	77	71	76	71	76	65	68	84	64.0	63.2	83	86	85	64	99	88.5
	40	53	.....	76	58	65	58	68	59	57	77	53.4	49.0	80	76	79	62	88	83
Fuel, Lbs. per B. H.P. Level Road	10	1.38	2.31	1.29	.....	1.63	2.3	1.05	2.25	1.65	1.59	1.40	1.80	1.50	1.78	1.35	.....	1.20	2.2
	20	1.14	1.50	0.97	.....	1.30	1.65	1.05	1.80	1.43	1.45	1.02	1.54	1.35	1.48	1.20	1.08	1.32	1.55
	30	0.96	1.14	0.85	.....	1.08	1.27	1.05	1.37	1.27	1.10	0.82	1.30	7.13	1.27	1.03	0.98	1.25	1.28
	40	0.91	.....	0.80	1.10	0.92	1.07	0.95	1.27	1.15	0.85	0.72	1.09	1.06	1.11	0.95	0.90	1.05	1.09
Fuel, Lbs. per B. H.P. Maximum Load	10	0.96	.....	1.2	0.88	0.84	0.96	0.8	1.23	0.73	0.82	0.71	.....	0.73	0.78	0.67	.....	.....	.....
	20	0.76	0.99	0.90	0.85	0.81	0.97	0.8	1.04	0.86	0.72	0.62	0.83	0.74	0.74	0.66	0.69	.....	0.85
	30	0.76	0.97	0.88	0.92	0.79	0.98	0.81	0.991	0.97	0.66	0.63	0.84	0.75	0.76	0.65	0.67	0.67	0.82
	40	0.91	.....	0.83	1.06	0.77	1.02	0.82	1.08	1.05	0.67	0.72	0.95	0.76	0.79	0.64	0.65	0.71	0.77
Miles per Gallon on Level Road	10	21.1	14.6	25.6	.....	25.4	18.7	27.0	15.2	15.8	16.3	26.3	17.0	16.6	14.1	23.0	.....	15.9	11.0
	20	20.0	17.1	27.0	.....	22.9	17.4	21.8	14.8	15.3	15.3	25.6	15.0	14.5	13.5	20.7	19.3	12.3	11.8
	30	18.0	16.0	22.5	.....	20.2	14.8	16.5	14.2	13.5	15.3	21.4	13.8	13.0	11.8	18.0	17.7	10.5	10.3
	40	14.1	.....	17.6	16.8	16.0	11.7	13.7	11.2	11.6	14.3	16.75	12.0	10.3	10.0	14.6	13.6	9.8	8.6
Miles per Gallon at Maximum Load	10	11.2	.....	8.2	10.2	7.5	7.7	7.2	4.4	6.8	6.0	10.9	.....	4.9	4.6	7.2	.....	.....	.....
	20	11.9	9.0	9.6	9.3	8.1	7.7	7.3	5.4	6.3	6.9	12.2	5.0	4.9	4.6	6.7	8.2	.....	3.8
	30	13.0	10.4	9.2	10.1	8.9	7.7	8.0	5.6	6.12	7.5	14.2	5.7	5.0	4.6	6.9	8.6	4.3	4.0
	40	14.1	.....	9.8	10.7	9.5	9.0	8.95	5.75	6.8	8.0	14.9	6.5	5.1	4.9	7.6	8.6	4.7	4.5

[1] Closed body, all others open types.
[2] Steam car.
[3] Based on indicated horsepower.
[4] Has planetary gearset which produces abnormal friction when rear wheels are driven with lever in neutral position.
F—Fabric.

eter Tests.

STEAM	TRUCKS				CLASS
S[1]	Speed M.P.H.	T	U	V	Car
1918			1919		Year—Model
2		4	4	4	No. of Cylinders
4x5		3¾x5	4⅛x4½	4¾x6	Bore and Stroke—Inches
		220	240	425.3	Piston Displacement—Cu. Ins.
20		22.5	27.0	36.0	H.P. Rating
130		132	130	160.5	Wheel Base—Inches
1,705		1,585	1,700	4,520	Weight Lbs. on Wheels—Front
2,215		1,880	1,760	6,625	Weight Lbs. on Wheels—Rear
3,920		3,465	3,460	11,145	Weight Lbs. on Wheels—Total
35x4½		35x5	34x4½	36x5	Front Tires—Size
		F-N	F-N	-S	Front Tires—Type and Tread
		90	75	Solid	Front Tires—Infl'n Press.
35x4½		35x5	34x4½	40.5	Rear Tires—Size
		F-N	F-N	-S	Rear Tires—Type and Tread
		90	75	Solid	Rear Tires—Infl'n Press.
1.5		6.0	4.6	9.56	Gear Ratio
25.3		23	22	46.0	Frontal Area—Sq. Ft.
16,500		250		305	Miles Run to Date
20	10	31	26	83	Rolling Resistance Front Wheels—Lbs.
20	20	31	26	83	
63	10	64	35	201	Rolling Resistance Rear Wheels—Lbs.
63	20	64	36	212	
83	10	95	61	284	Rolling Resistance Complete Car—Lb.
83	20	95	62	295	
7.6	10	7	6.6	13.8	Wind Resistance, Various Speeds, Lbs.
30.4	15	16		31	
68.4	20	28	26	56	
121.6	25	43			
27.6	10	38	32.6	96.8	Tractive Effort, Level Road, Lbs.
50.4	15	47		114	
88.4	20	59	52	139	
141.6	25	74			
763	10	413	300	1,009	Maximum Tractive Effort Direct Drive—Lbs.
367	15	400	322	870	
212	20	363	385	640	
143	25	315	360		
18.5	10	10.4	7.4	8.1	Maximum Grade Direct Drive—Per Cent.
7.8	15	9.8		6.7	
3.0	20	8.5	9.3	4.4	
	25	6.7			
0.74	10	1.01	0.87	2.58	Rear Wheel H.P. Level Road
2.70	15	1.90		4.55	
7.1	20	3.15	2.77	7.41	
15.1	25	4.90			
20.3	10	11.0	8.0	27.0	Rear Wheel H.P. Maximum Developed
19.6	15	16.0	12.8	34.8	
17.0	20	19.3	20.5	34.2	
15.3	25	21.0	24.0		
1.68	10	1.71	0.93	5.37	H.P. Lost—Transmission and Rear Tires
3.4	15	2.57	1.4	8.25	
5.0	20	3.42	1.92	11.30	
6.7	25	4.28	2.4		
2.42[3]	10	2.72	1.80	7.95	Brake H.P. Required Level Road
6.1[3]	15	4.47		12.80	
12.1[3]	20	6.57	4.69	18.71	
21.8[3]	25	9.2			
22[3]	10	12.7	8.9	32.4	Brake H.P. Maximum Developed
22[3]	15	18.6	14.2	43.1	
22[3]	20	22.7	22.4	45.5	
22[3]	25	25.3	26.4		
246[3]	10	79	65.0	77	Brake M.E.P. at Maximum Load
123[3]	15	78	69.0	68	
83[3]	20	71	81.5	54	
62[3]	25	63	77.0		
1.83[3]	10	1.08	2.50	1.50	Fuel, Lbs. per B. H.P. Level Road
1.55[3]	15	1.08		1.25	
1.35[3]	20	1.08	1.48	1.13	
1.17[3]	25				
	10	0.83	1.42	0.79	Fuel, Lbs. per B. H.P. Maximum Load.
	15	0.83	1.34	0.81	
1.17[3]	20	0.80	0.94	0.86	
1.17[3]	25	0.83	0.75		
15.0	10	20.6	13.7	5.2	Miles per Gallon on Level Road
14.1	15	18.9		5.8	
12.2	20	17.1	17.7	5.8	
10.3	25				
	10	5.75	4.9	2.4	Miles per Gallon at Maximum Load
	15	5.9	4.9	2.6	
7.8	20	6.7	5.8	3.1	
10.2	25	7.25	7.8		

C—Cord. S—Smooth tread.
N—Non-skid tread. R—Ribbed tread.

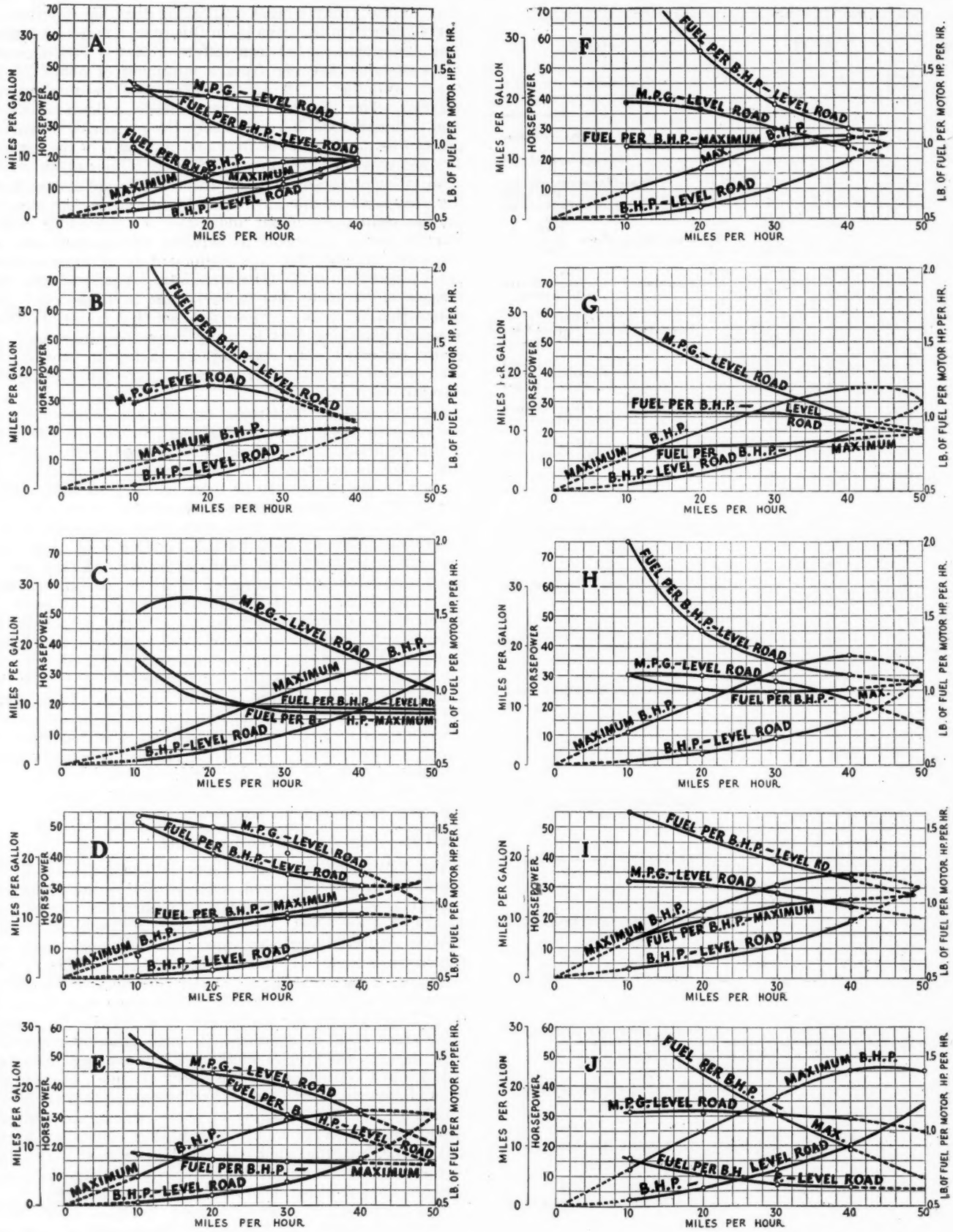
tion gears, propeller shaft and primary shaft of gearset, is in nearly all cases from 50 to 100 per cent higher than that of the front wheels, indicating that the friction of parts other than the tires is, in this case, a material factor. The divergence as between different cars is considerable, the resistance varying from a minimum of about 25 lb. to a maximum of 79 lb. in the case of pneumatic-tired vehicles. The weight of the rear wheels in these two cases was 1120 and 3000 lb. respectively, the resistance in pounds per ton being 44.7 in the first case and 52.7 in the second. In most cases the resistance is slightly higher at 40 m.p.h. than at lower speeds, but the difference is not great. Rolling resistance of the entire car is, of course, the sum of the resistance considered under the two preceding heads. That it varies materially as between various cars even of the same weight and tire equipment is at once evident from inspection of the tabulated data. A part of this difference is no doubt due to variations in adjustment and lubrication but it is a noteworthy fact that material differences do exist and that in many cases the cause could be easily remedied with considerable saving in power and fuel as well as in wear if the fault were more generally recognized.

If the rolling resistance figures are reduced to a comparative basis, that is expressed in pounds per ton, it will be found in most cases that cars equipped with cord tires have an average total rolling resistance of about 35 lb. per ton as against 50 or more lb. per ton with fabric tires. If we compare some rather extreme cases, say that of cars E and G in the same price class and weighing respectively 3390 and 2915 lb. both having 4-in. tires, the first cords and the second fabric type, we find that car E has a total rolling resistance of 51 lb. or 30.1 lb. per ton, while car G has a resistance of 75 lb. or 51.4 lb. per ton, an increase of over 70 per cent. In terms of power required for propulsion on a level road, wind resistance not included, the figures are respectively 2.72 and 4.0 hp. actual, or 1.6 and 2.74 hp. per ton at 20 m.p.h. At 40 m.p.h. the power required is twice as great. The differences may not seem material as compared to the maximum power capacity of the engine, but when it is realized that under the light loads involved the engines in question use 1.05 and 1.30 lb. of fuel per b. hp. respectively it is evident that the economy can be materially improved by avoiding unnecessary power losses.

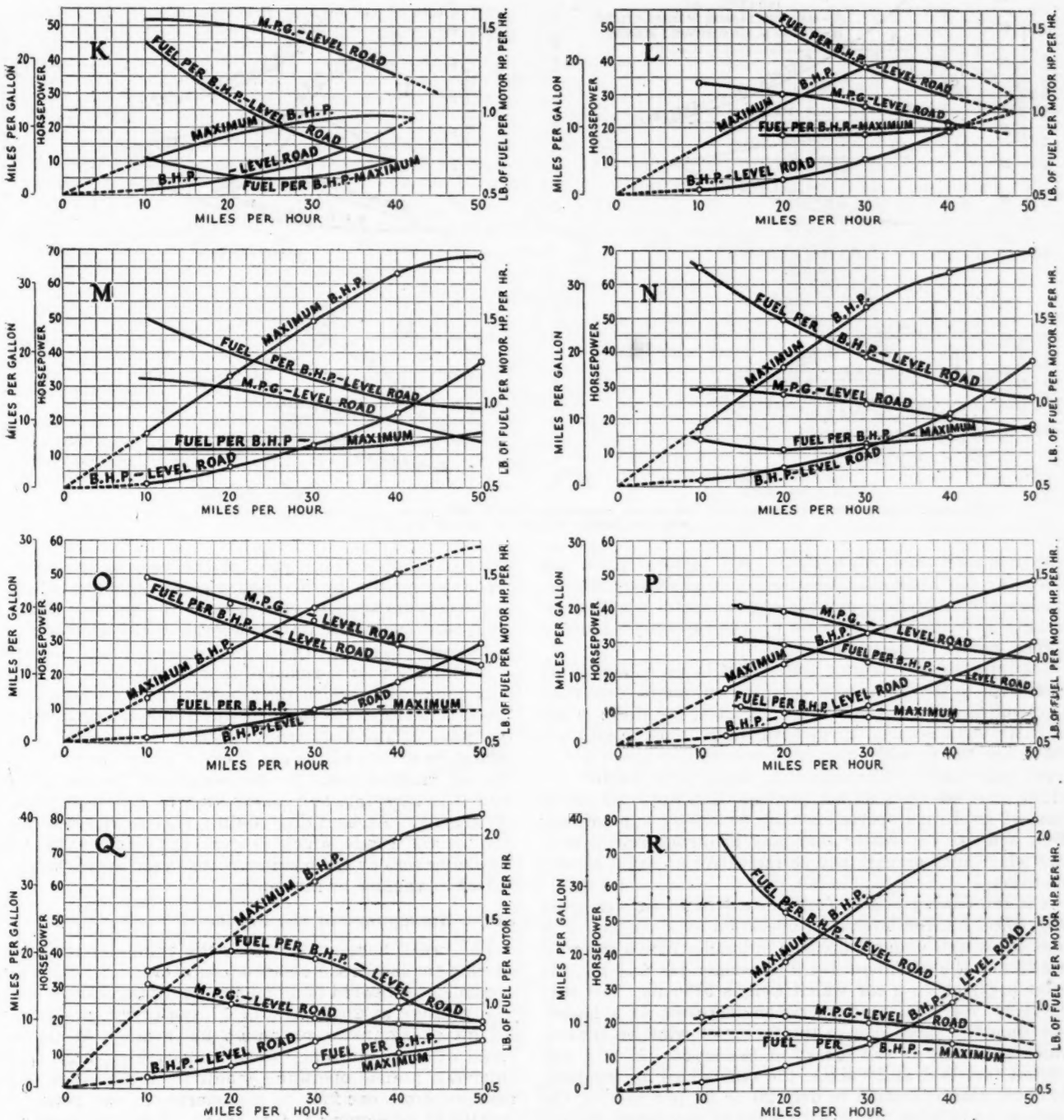
Wind Resistance and Tractive Effort

The figures on wind resistance in the table are computed, as already explained, by determining the projected frontal area of the car and multiplying the number of square feet by 0.003, the square of the speed in m.p.h. This, of course, is only an approximation, since the wind resistance is materially affected by the stream lines of the body, but it serves well enough for comparative purposes. According to the figures given frontal areas vary from 16 to 32.5 sq. ft. on the passenger cars listed. No doubt these areas could be decreased in some cases by improved body design, but precise methods of measuring wind resistance are needed before the effect of such changes can be predicted with certainty. It will be noted that the wind resistance becomes a factor of some importance even at speeds as low as 20 m.p.h. At higher speeds or when driving against the wind, the wind resistance, according to the method of figuring here employed, is shown to exceed in amount other level road resistance factors.

The figures in the column headed "tractive effort, level road," in the table are obtained by simply adding together the wind resistance and the front wheel resistance. This gives the pull which must be exerted at the periphery of the driving tires to propel the vehicle on a hard, level road at the various speeds indicated. In testing cars on



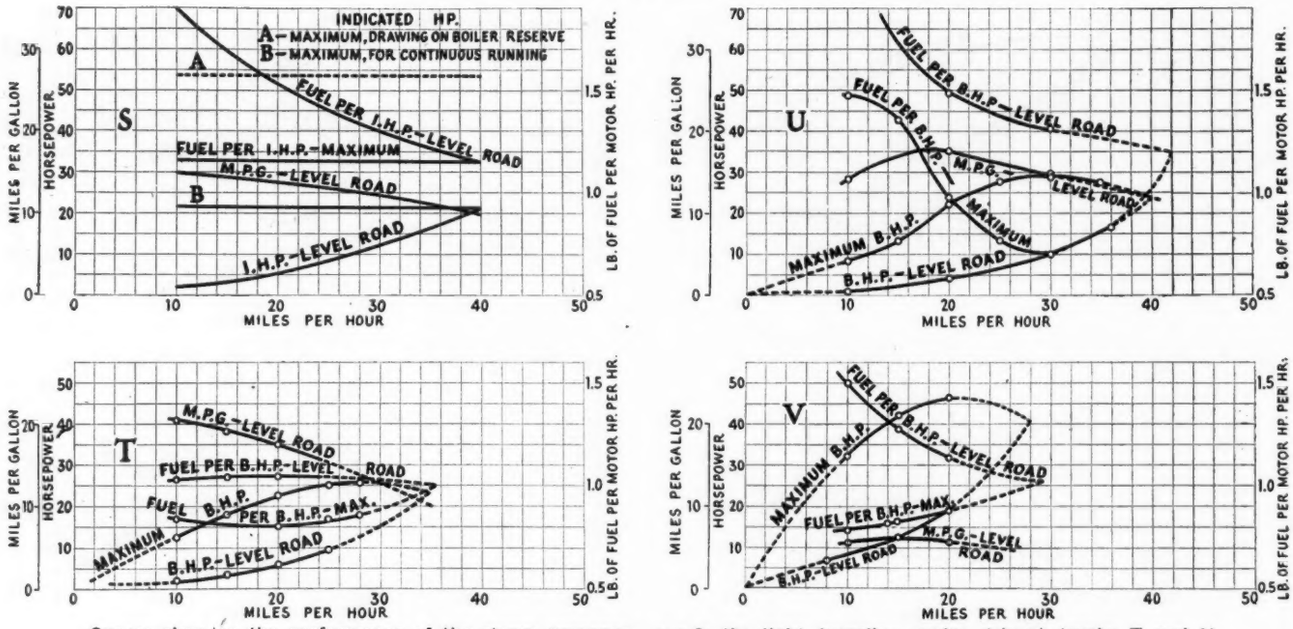
Performance curves of passenger cars A to J.



Performance curves of passenger cars K to R.

the dynamometer here described the brake is set to give a load equivalent to the tractive effort required for level road operation at the respective speeds, and the fuel consumption is then measured. The horsepower developed at the rim of the rear wheels under this condition is computed by simply multiplying the pull by the speed in m.p.h. and dividing by 375. The figures thus obtained are set down in the column headed "rear wheel hp. level road." In order to find the b.hp. required for level road operation it is necessary to add to the rear wheel hp. the loss in power between the engine and the road, including, of course, the power lost in the rear tires. This is assumed to be the same as the power consumed in the rolling resistance of the rear wheels and the parts driven by them when the gears are in neutral and is obtained by multiplying this rolling resistance in lbs. by the speed in m.p.h. and dividing by the constant 375.

That this is not a precisely correct method is probable, because the power loss when the gears are driving under load is presumably not the same as when they are running idle. It is doubtless true also that the tires consume a somewhat greater power when transmitting power than when rolling idle. Furthermore, when the engine is driving the car even on direct, the secondary shaft of the gearset is, in most cars, turning and consuming more or less power due to churning of the oil or grease in the gearset. When the wheels are driving the propeller shaft and the primary gearset shaft attached to it, the secondary shaft does not turn, hence the loss to this source is not included in the measurements of transmission losses here given. While this discrepancy is well recognized by Prof. Lockwood and his associates, it is probably not a very considerable factor in most instances, and can, therefore, be overlooked without great error. In any case the results



Curves showing the performance of the steam passenger car S, the light (gasoline engine driven) trucks T and U and the heavy "Class B" Army truck V.

here reported shed much light upon factors which are given far too little consideration by most automotive engineers and, therefore, serve a highly useful purpose, especially in the absence of more precise information on the various points in question.

The practice of making tests with loads substantially equivalent to those imposed upon the engine in level road operation is especially to be commended, for there is far too little data secured in general under these conditions which are the prevailing ones in service and therefore of great importance. Consequently, while it is readily admitted that the tests do not precisely duplicate the conditions of level road operation, they do closely approximate them and are far better than any arbitrary selection of load which may or may not be indicative of usual service conditions.

It is interesting to note from the tabulated data that the rear wheel hp. for level road operation at 20 m.p.h. is in most cases well under 3 hp., the minimum figure recorded is 2.29 and the maximum for a passenger car 4.03 hp., the latter applying to a car which weighs 5180 lb. The rear wheel hp. for level road operation increases at a higher rate than the speed due to the factor of wind resistance, which increases as the square of the speed. It is a significant fact that at 20 m.p.h. the rear wheel hp. required for level road operation is only 20 or 25 per cent of the maximum available, while with some of the larger cars it is only 10 per cent of the maximum available. This, of course, means that the car has a very low average power factor, and, since the economy of throttling engines of the conventional type is low at low loads, the engine operates most of the time under loads at which its thermal efficiency is poor.

The maximum tractive effort which the cars tested are capable of developing when running in direct drive is of interest chiefly as indicating the reserve power which American cars have for hill climbing and rapid acceleration. The advantage of this quality is appreciated by the user insofar as it affects performance to a marked degree, but the adverse effect upon the fuel economy which is involved in the use of large gear reductions and consequent high engine speed with its accompanying excessive friction loss and average operation under low throttle conditions is seldom fully appreciated.

The maximum grade (expressed in per cent) which the car will climb in high gear at the various speeds is determined readily by dividing the net tractive effort, or the maximum tractive effort minus the tractive effort for level road operation, by the weight of the car plus whatever load it carries. In the figures here given the weight of the driver only is added to that of the car in computing maximum grade which the car will climb on direct drive. Since acceleration is equal to the force acting divided by the mass of the body whose velocity is changed, the accelerating ability of the car is easily computed by dividing the net tractive force by the weight of the car plus the load it is carrying, and multiplying by g, the acceleration of gravity. Accelerating ability varies with the speed, just as the grade which the car can climb varies, both becoming zero at the maximum level road speed which the vehicle is capable of attaining.

Brake Horsepower of the Engine

The brake horsepower which the engine is required to develop for level road operation at average driving speeds is small as compared to its maximum power at these speeds. The average at 20 m.p.h. for 17 passenger cars is about 5.4 hp. as against a maximum hp. average at the same speed of 23.8. In other words, under what may be considered a normal operating condition, the average engine develops from one-fifth to one-quarter of the power it is capable of developing at that speed. Even the heaviest of the passenger cars tested requires only 7.55 b.hp. to propel it at 20 m.p.h. on a level road while some of the lighter cars require only a little over 4 b.hp. Were facts such as these more generally appreciated, it seems almost incredible that so little attention would have been given to making engines which are more efficient at the light loads obtained in normal use.

It is instructive to note from Table II, which is condensed from Table I but contains some additional computations, the relative importance of the three losses which together exactly balance the power developed at the flywheel of the engine. These are (1) the rolling resistance of the front wheels, (2) the power losses between the engine and the driving surface of the rear tires, including the losses in these tires and (3) the wind resistance. It will be seen that (1) varies from 20.2 to 30.8 per cent of the total, the average being nearly 27 per cent. Item (2) accounts for an average of 46 per cent, varying

from 37.5 to 55.7 per cent of the total, while item (3) averages the same as (1) but varies from 19.5 to 37.8 per cent of the total. These figures apply to a speed of 20 m.p.h. on a level road, with no head wind. At other speeds and loads the factors vary, the windage in particular increasing rapidly with increase in speed.

If it is assumed that the rolling resistance of the rear tires alone is the same as that of the front tires the remaining power losses attributable to friction of mechanical parts, including the gearing in the axle and the bearings plus the losses caused by any churning action on lubricants amounts to about 20 per cent of the total brake power developed by the engine. Tire losses alone probably amount to about half of the total under the conditions in question, and these losses are minimized when a good grade of cord tire properly inflated is used. That there is a large variation both in the amount and percentage of the various losses is at once evident, but the reason for the variations are not apparent from the data in hand. It is probably fair to assume, however, that the higher figures can be bettered in most cases if a more detailed analysis of the reasons for the loss were made. In comparing the figures for different cars it should be borne in mind that rolling resistance usually increases with increase in weight, other things being equal. Evidently other things are not equal in some of the cases recorded. Probably the variation in tire equipment accounts for a considerable part of the difference in some instances.

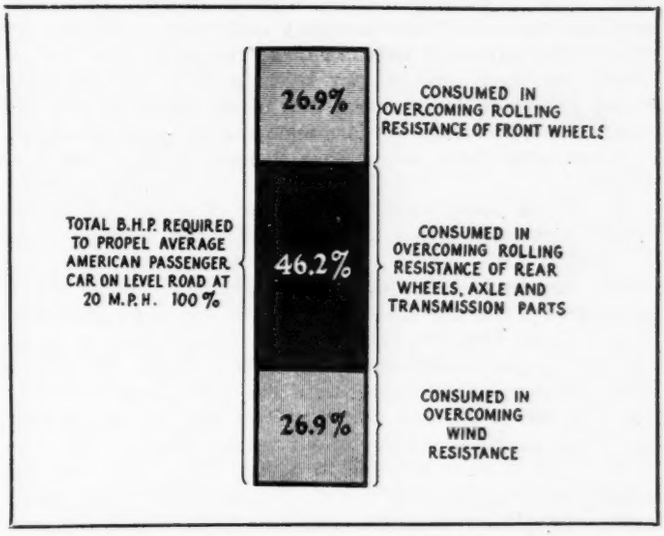

TOTAL B.H.P. REQUIRED TO PROPEL AVERAGE AMERICAN PASSENGER CAR ON LEVEL ROAD AT 20 M.P.H. 100%
26.9%
CONSUMED IN OVERCOMING ROLLING RESISTANCE OF FRONT WHEELS
46.2%
CONSUMED IN OVERCOMING ROLLING RESISTANCE OF REAR WHEELS, AXLE AND TRANSMISSION PARTS
26.9%
CONSUMED IN OVERCOMING WIND RESISTANCE

Chart showing losses which balance the power developed by the engine of the average passenger car when running at 20 m.p.h. on a hard level road.

Efficiency of Power Transmission

If we accept as correct for conditions of power transmission the power losses recorded we find that the ratio of power delivered at the periphery of the driving tires to the brake power developed by the engine, or what may be termed the efficiency of the drive is 0.89 to 1 in the average case for passenger cars running under wide-open throttle at 20 m.p.h. The variation under this condition is from 78.5 to 93.2 per cent. The reasons for believing that the power losses are somewhat greater when the transmission system is running under load rather than running idle, as it was when the power losses here given were measured, have already been stated.

There is little doubt that the tires are much the largest single source of power loss in the transmission, even though they be of the cord type. For this reason such relatively slight difference as may be caused by differences in the bevel gears are probably not of great importance in the total, although it is quite conceivable that a change in the type of gearing employed might have a marked effect. It should not be forgotten, however, that the total loss in the mechanical parts other than the tires is quite considerable, as already pointed out, so that each of these losses should be minimized in the interest of high over-all efficiency.

Fuel Economy at Various Loads

Coming now to the matter of fuel consumption, we find, as anticipated, that the rate at which fuel is used per b.hp. at the light loads of average normal use is very much greater than at full load. The average consumption of 17 of the passenger cars listed is 0.80 lb. per b.hp.-hr. at wide-open throttle and a speed of 20 m.p.h., the maximum and minimum figures for the same conditions being respectively 1.04 and 0.66 lb. With the engine operating under level road conditions and at the same speed the average consumption of the same 17 cars is 1.34 lb. per b.hp.-hr., or nearly 70 per cent higher than at full load. The maximum and minimum figures under this condition are respectively 1.80 and 0.97 lb. From curves given in the accompanying charts it is apparent that in most cases the engine operates most efficiently when running under wide-open throttle at speeds corresponding to 20 or 30 m.p.h. on the road, a condition of operation which obtains, in all probability, much less than 1 per cent of the time the car is in actual operation. Under the conditions of average normal operation, on the other hand, the thermal efficiency averages little more than half that obtainable under the comparatively unusual condition of wide-open throttle. Such a condition would not be tolerated in the operation of any other class of powerplant in extensive

Table II.—Showing Brake Horsepower Required to Propel Car on Level Road at 20 M.P.H. and the Various Factors Responsible for Consumption of This Power

Car	A		C		E		G		I		K		Q		Average
	Hp.	Per Cent of Total	Hp.	Per Cent of Total	Hp.	Per Cent of Total	Hp.	Per Cent of Total	Hp.	Per Cent of Total	Hp.	Per Cent of Total	Hp.	Per Cent of Total	Per Cent
Type of Tires.....	Fabric		Cord and Fab.		Cord		Fabric		Fabric		Cord		Cord		
Hp. Consumed in Overcoming Front Wheel Rolling Resistance	1.09	20.2	1.65	35.2	0.91	22.5	1.65	30.8	1.71	30.4	1.15	24.4	1.87	24.8	26.9
Hp. Consumed in Overcoming Rolling Resistance of Rear Wheels, Axle and Transmission Parts	2.93*	54.2	1.76	37.5	1.81	44.7	2.35	43.7	2.77	49.2	1.79	37.8	4.21	55.7	46.2
Hp. Consumed in Overcoming Wind Resistance	1.39	25.6	1.28	27.3	1.33	32.8	1.37	25.5	1.15	20.4	1.79	37.8	1.47	19.5	26.9
Total = B. Hp. Required to Propel Car on Level Roads	5.41*	100.0	4.69	100.0	4.05	100.0	5.37	100.0	5.63	100.0	4.73	100.0	7.55	100.0	100.0

*Has planetary gearset which produces undue friction when rear wheels are driven with gear shift lever in neutral position.

use. Most powerplants are designed to give, so far as possible, their maximum economy under the conditions for which they are most used. Not so the motor car engine. There are many reasons for this condition, among them being a more or less general lack of understanding of the conditions of average performance and of steps which can and should be taken to increase economy under these conditions.

It will be noted that the number of miles per gallon which a car will travel decreases as a rule with increase in speed. This is due, of course, to the fact that the power required for propulsion is less at the lower loads, although the thermal efficiency at these speeds is much less. It is evident, however, that, since a certain power is necessary to propel a vehicle at any given speed, the engine which develops this power with the least expenditure of fuel per hp. is the one which will propel the car at that speed the greatest number of miles per gallon of fuel consumed. If it were feasible to design the car so that the engine, which is usually most efficient at full load, could operate at full load under normal speed and level road conditions, it would, of course, go much further per gallon than at present. Since this is not feasible, it is desirable to strive to make the engine as economical at low as at high loads. This is a difficult problem, but steps in the right direction are being made and should receive more encouragement than they are generally given at the present time.

Performance of Steam Car and Trucks

Much of the foregoing analysis applies primarily to the passenger cars A to R inclusive as listed in Table I, but most of the points brought out apply also to the light trucks T and U and many of them to the steam-driven passenger car S and the heavy Class B army truck V, although certain of the data in reference to the last two vehicles mentioned are, for obvious reasons, quite different than that covering the passenger cars of the usual type. Since in the steam car the engine is geared directly to the rear axle—that is, drives the axle without a clutch between the two—the friction of the engine is included in the rolling resistance of the rear wheels, and the power of the engine is the indicated instead of the brake power, the latter being obtainable by the usual method employed in other cases. The fuel measurements are also based on indicated power. The data covering the indicated m.e.p. of the steam engine, while not directly comparable to the brake m.e.p. given for engines in the other cars, shows immediately why steam cars do not require the use of a gear-set such as is employed in the conventional gas car and truck.

The standard Class B army truck is much the heaviest of the cars tested and the only one equipped with solid tires. It will be noted that the rolling resistance of the front wheels at 20 m.p.h. is 83 lb. or 36.7 lb. per ton as compared to 30.2 lb. per ton for the largest cord tire on the passenger cars. Corresponding figures for rolling resistance of rear wheels is 212 lb. total or 64 lb. per ton as against 52.7 lb. per ton, the figure for the passenger car having the highest rear wheel rolling resistance. The rear wheel hp. required to propel the truck at 20 m.p.h. is 7.41 or 1.33 hp. per ton as compared to 4.03 hp. or 1.56 hp. per ton for that passenger car which required the largest amount of rear wheel hp. at the same speed of all those tested. For the truck the b.hp. required for level road propulsion at 20 m.p.h. was 18.71 or 3.36 b.hp. per ton as compared to 7.55 b.hp. or 2.85 b.hp. per ton for the heaviest passenger car tested. The ratio of the power delivered at the rear wheels to brake power developed by the engine under wide throttle conditions is 34.2 to 45.5 showing that the efficiency of power transmission (rear tire losses included) is only 75 per cent, or lower than that of any of the passenger cars. The maximum miles per gallon recorded for the truck in question was 5.8, or 32.3 ton m.p.g. approximately the same as the equivalent reading for the heaviest passenger car.

Cutting Fluids

TECHNOLOGIC PAPER NO. 204 of the Bureau of Standards on the subject of cutting fluids will soon be available for distribution by the Government Printing Office.

The paper is divided into two parts, theory and practice. In the first part the difficulties attending the proper lubrication of the cutting tool in machine work are described, and the reasons why lard oil is particularly suitable for this work are set forth. It is shown that the viscosity of an oil is not the only factor to be considered in this connection. Oils for cutting purposes should have a high adhesion, and it seems possible to improve mineral oils by adding such fluids as oleic acid, pine oil and fixed oil.

An important function of cutting fluids is to cool the tool and chip, and for this purpose alone water with its high specific heat is well suited, but it rusts the machines, and for this reason where water is used such alkaline substances as soda or soap are always added. In conclusion, Part 1 suggests methods for the measurement of the adhesion of oils.

Part 2, practice, considers the correspondence which the Bureau conducted with many large machine shops throughout the country as to their experience with cutting fluids. The different kinds of oils which have been used for this purpose are listed, and attention is given to the possibility of using emulsions made up of mineral oil compounded with neutralized sulfonated oil and formed into a permanent emulsion with water.

Mineral oils compounded with alcoholic solutions of soap and a thick soap solution and mineral oil marketed as a paste, are also described. In choosing any cutting fluid it is pointed out that the character of the metal to be worked should be considered. Brittle metals, such as cast iron, are easier to lubricate than the so-called "draggy" metals, such as soft steel and wrought iron.

Porto Rican Market Opening Up

THE head of the largest automotive business in Porto Rico, who was in New York recently, declared that business is on the upgrade again in that country and that it should again be considered in the buying column. No stocks of new cars are on hand, and orders are being placed rapidly. The new sugar crop will soon be coming in, and automobiles are needed to take care of transportation needs not provided by the railroads. The railroad services in Porto Rico are poor but the highways are good. Hundreds of motor buses are already in operation and the use of trucks is growing.

A CATALOGUE of the Mechanical Engineering Collection in the United States National Museum has recently been compiled by the Smithsonian Institution in the form of Bulletin No. 19 of the Museum, and can be obtained from the Superintendent of Documents, Government Printing Office, Washington.

An Efficient Method of Transmission Production

Methods employed in the Hudson and Essex Transmission Department. Drilling of cases and machining of gear blanks accomplished by labor saving methods. Gears matched for best mesh by a special testing device.

By J. Edward Schipper

AN interesting example of what can be done in efficient production is offered by the transmission departments of the Hudson and Essex companies. Transmission units were formerly made in separate departments, and there were a number of breaks in the continuity of manufacturing progression. By bringing the two transmission jobs into one department, the cost of manufacture, as compared with that of a year ago, has been cut at least 40 per cent. The departmental overhead has been practically cut in half by a rearrangement of the machines and by better placing of the workmen; the labor cost has been reduced 25 to 30 per cent and the manufacturing operations on the two types of transmission require only little more than the floor area formerly required for one. The work in this department is handled on the group system, in accordance with the general practice in the Hudson factory.

An idea of the efficient operation of the department may be gained from the fact that 75 cases for the Hudson car, each requiring 24 operations, have been put through daily by six men during the time of curtailed production. Now that production is increasing rapidly, practically the same ratio of operators is being maintained, indicating a highly efficient arrangement of machinery and the use of types of machines, which, in a great many instances, are so nearly automatic that three and sometimes four machines can be taken care of by one operator.

The way the transmission department is at present laid out, it can take care of 150 Hudson and 150 Essex cases per day. The machining operations on the two types of case are practically identical in character, although the dimensions of the case and some of the details differ. The machining operations run along parallel lines and the work supervision is taken care of by one staff instead of two, which has been a material factor in the reduction of overhead. An outline of the methods employed in manufacturing the transmission case is of interest.

The cases are of aluminum and are checked in the receiving room on a target, to make sure that there is sufficient metal at all points for the initial cuts. Location on this target is by two V-blocks on the countershafts bearing at both ends of the case. This same method of location is employed for the first operation on the case, which is milling the top face (Fig. 1). Two cuts are taken off the top face on a Cincinnati miller, the first being a rough cut, ⅛ in. deep, and the second a finish cut in which only about 1/64 in. of metal is removed from the top face.

Using the milled face as a location with V-blocks on the two countershaft bearings, the main and countershaft bearings are rough and finish bored. Both sides of the transmission case are worked on simultaneously by means of four tools (Fig. 2). The rough and finish cuts are taken on the same machine. The first tool to enter takes the rough cut, and as soon as this is clear of the hole the finishing tool takes up the work. The work is handled on a Barnes double-head, horizontal boring mill, and 0.004 in. is left for finish reaming both bores.

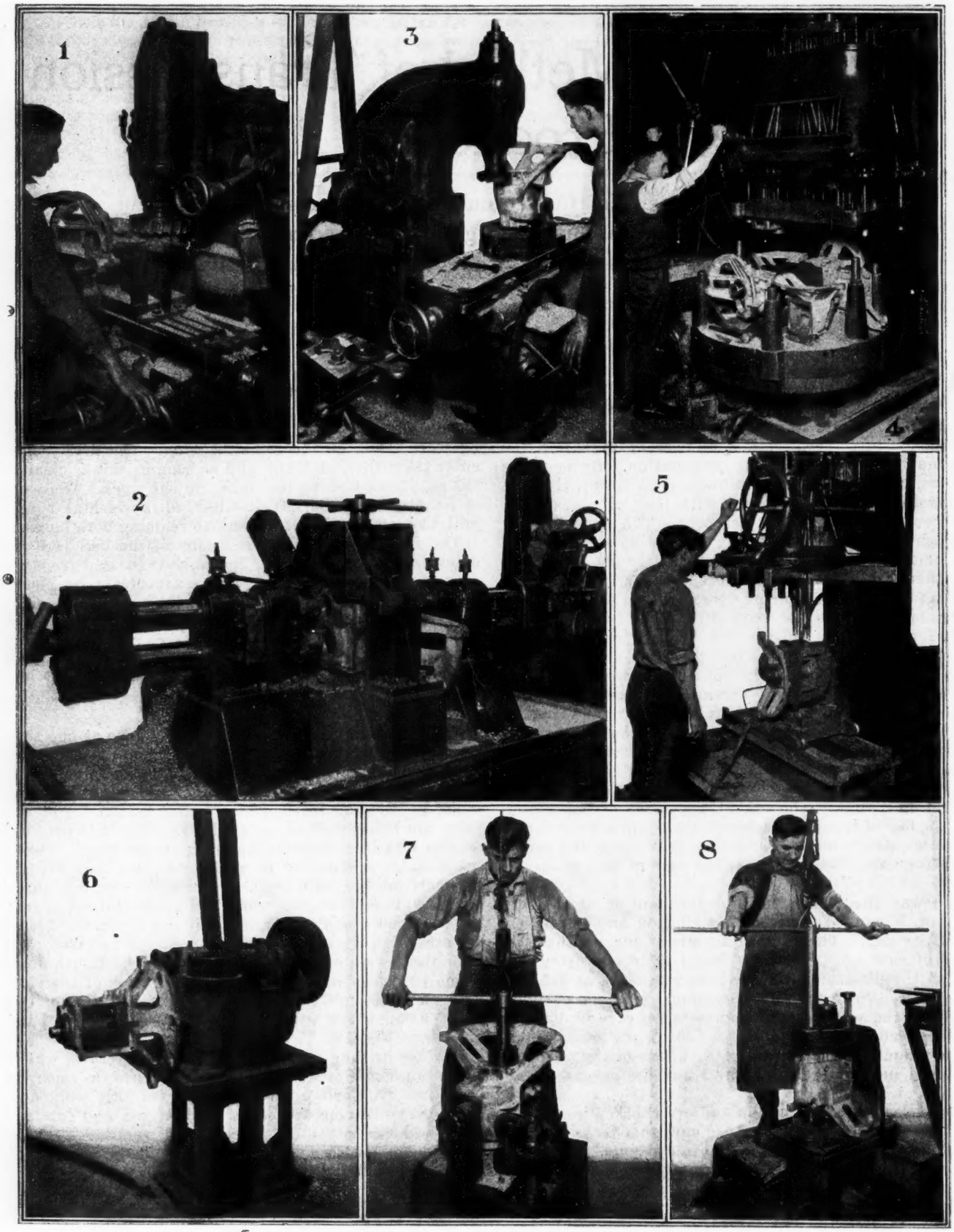
The front end of the case inside of the bell is faced off in the next operation. The work is located from the rear end face, lengthwise, and transversely by means of an arbor which passes through the main bore. This operation of facing off the front end fixes the length of the case. The work is done on a Baker mill. Following this operation, there is another milling job on the pedal bosses, this work also being located from the rear end and on the arbor through the main bore. This latter work is done on a Steptoe mill.

Nearly all the drilling on the case is done at one time on the ingenious Natco multiple spindle installation, Fig. 4. This machine works on different sides of three different cases at the same time, and, having an indexing table, permits of three others being loaded while the three are being worked upon. In this way it is possible to pass 60 cases through the machine per hour. Twenty-six holes are drilled in each case, and they are all located from the main bore. Formerly it required three machines to do this same work, and a material cut in cost has been made, as there is now only one operator. There are other drilling operations which cannot be taken care of on the Natco; one of these is handled by a Baush drill, which performs two operations on two sides of the case with an indexing fixture. The holes drilled are for the pedal bolts, brake ratchets, anchor pins and oil level indicator (Fig. 5).

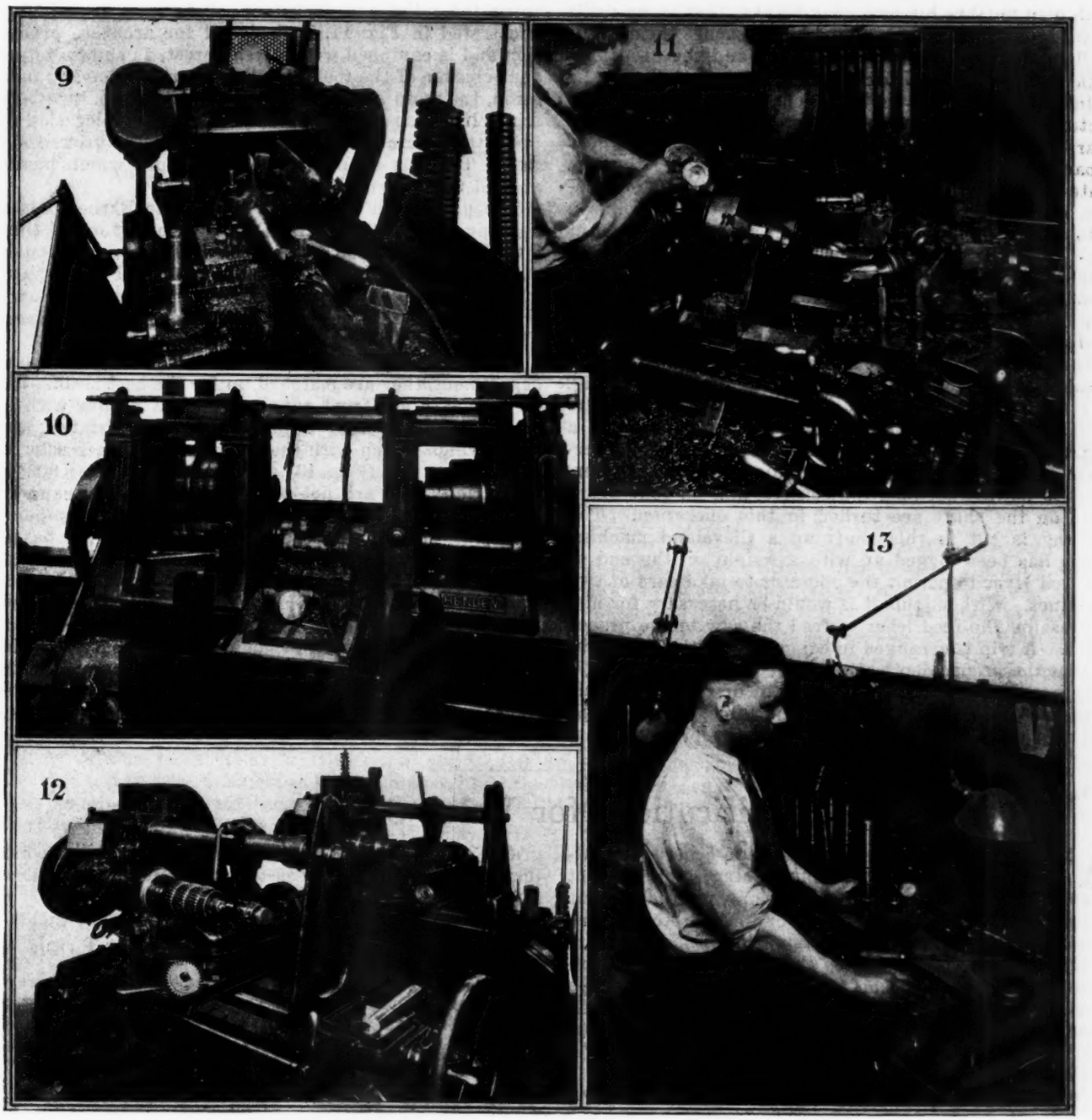
Another drilling operation is for the oil return, which is on an angle and consequently requires a separate operation. A Carlton radial is used for this work and also for spot facing the brake ratchet boss and for tapping the holes in the boss and the oil level holes. This same machine also drills, spot faces and taps the drain plug holes at the bottom of the transmission case.

Both ends are tapped on a Carlton radial with a reversing fixture, and a similar machine taps the top face flange holes and the brake pedal holes. Finish reaming of the main bore is a hand operation of line reaming.

In finish milling the bell flange (Fig. 6), the case is located on an arbor through the main bore, with the front face resting against a shoulder on the arbor. The distance from this holder fixes the length from the front



1—Initial milling operation on top face of Hudson transmission gearcase. Machine takes rough and finish cuts. 2—Rough and finish boring main and countershaft bearing bores on one machine, boring from both ends simultaneously. 3—Milling front end of gearcase on a Baker mill, fixing length of case. 4—Natco multiple spindle drill which handles different sides of three cases while three more are loaded on fixture. Capacity 1 per min. 5—Drilling Hudson transmission case for oil level hole and pedal control bracket hole. 6—Finish milling the bell flange, location secured by the arbor through the main bore. 7—Finish reaming main shaft bore. This is a hand operation for best possible finish. 8—Finish reaming the transmission countershaft bore. Note fixture, which pilots above and below the reamed hole



9—Turning two sides and face of the transmission main shaft drive gear simultaneously on an automatic lathe. 10—Straddle milling to length transmission main shaft drive gear. 11—Pratt & Whitney machine which rough and finish turns the main shaft drive gear bores for the internal bearing, turns relief and chamfers. Note steady rest on machine on each side of chuck. 12—Rough cutting six main shaft gears simultaneously on a Barber-Colman hobbing machine. Teeth are finished on Fellows shapers. 13—Rolling and matching gears for transmission gearset before sending them to final assemblies

face to the front of the bell. With the case in practically a finished condition, the bell housing is drilled and reamed for the dowel pin holes, which locates the bell housing against the dowels on the crankcase. Location for drilling these dowel holes is from the main bore and from a dowel through the center bell housing bolt hole. The location being primarily from the main bore, alignment of the transmission housing with the center line of the crankshaft is assured.

The final operations on the case are spot-facing the bosses on the bell flange, drilling, reaming and spot-facing inside and outside with a combination tool, the reverse idler shaft hole, and then finish reaming the countershaft bore. A feature of interest in connection with the reamer used for the countershaft bore is that pads are placed on the reamer acting as bearing surfaces, giving chip clearance which would not be available with a solid type of reamer. In order to secure the utmost accuracy in this final reaming operation (Fig. 8), the reamer shaft pilots above and below the reamed hole and is held to very close limits. This finishes the case, which is then washed in sal soda and passed along to the assembly line.

Manufacture of the transmission gearcases is backed up by a very efficient gear department. The forgings are bought outside, but all of the machining and forming is done in the Hudson-Essex transmission department. In the initial operation for the forming of the blanks,

each man finishes his own gear blanks; that is, he drills them, round-broaches them and key-broaches them. The drilling is done on Foote-Burt drills and the broaching both for the round-broach and the key-broach, on La Pointe broaches. In this little department for the manufacture of the blanks, five men can turn out 1700 to 1800 gears per day. These blanks are turned over to the gear department, the gears, regardless of size, going through quite similar operations. The first operation, ordinarily, on any of the gears is done on Potter & Johnson automatics. In this operation three faces are turned at once (Fig. 9). The machine turns both sides and the outside diameter. These Potter & Johnson lathes are so lined up that one man can take care of four machines. The machines turn out about 12 per hour, giving a production of 48 per hour per man on this particular job.

The Essex countershaft has an integral gear. This is straddle milled to length on a Hendey duplex mill (Fig. 10.) The countershaft is centered at both ends on a De Whiton centering machine and is then turned over to a Fay automatic which rough and finish turns the countershaft on the same machine. In this work the countershaft is located between the centers, and all four diameters on the shaft are turned in this operation. The key-way is cut in this shaft on a Cleveland machine which has been rigged up with a weight on the end of the feed lever to permit the operator to take care of two machines. Without this it is would be necessary for him to press on the feed lever to feed the saw to the proper depth. A trip is arranged in connection with the weight so that the proper depth will not be exceeded.

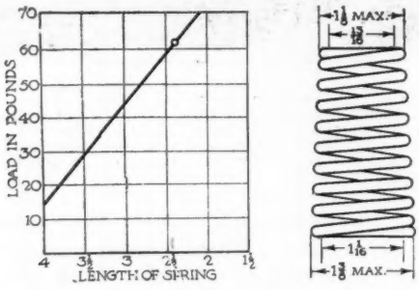
The second operation on the main drive gear is performed on the Pratt & Whitney machine, which rough and finish turns the gear, bores for the pilot bearing, turns the relief and chamfers. This machine, which is illustrated in Fig. 11, is designed for accurate production and is equipped with a steady rest, as shown, to prevent chatter of the tools. Following the automatic operation, the main shaft drive gear is ground for two bearings. It is also ground for the internal bore, location for the latter operation being from the outside ground surface. There is a bushing on the fixture which locates around the external grind.

The gear teeth are rough cut on the Barber-Colman hobbing machine. One man takes care of four of these machines and on some of the gears six can be roughed out at a time by placing them face to face (Fig. 12). One of those gears, of which six can be roughed out at once, is the countershaft constant mesh gear for the Essex. The gear teeth are finished on Fellows shapers.

Before the gears are sent to the transmission assembly department, they are matched up for the best mesh. Different gears are tried out on a special fixture with an amplifying gage and adjustable center distance, and those which match with the least "run-out" are selected to run together (Fig. 13). They are held to 0.002 in. eccentricity and are not permitted to have a "run-out" between the gears of more than 0.004 in. at any point. After this selection has been made the gears are passed along and meet the cases at the point where assembly takes place. The assembly is progressive and the line is equipped to handle either Essex or Hudson transmissions. As production is being increased rapidly at the plant, the figures here given are somewhat out of date, but give an idea of the ratio of men to assemble cases. At the time the notations were made, six men were assembling 120 cases per day, or an average of 20 transmission gearsets to the man per day.

Specifications for Valve Springs

AN interesting point which may have come to the attention of engineers and purchasing agents is that where valve springs are specified simply by the amount of compression for 60 lb. pressure or for any other figure which may be given, considerable variation has been experienced in the bids made by the different concerns on these springs. The reason for this is that it is possible to make up the valve spring with fewer turns and with other variations so that it is perfectly possible to meet the compression specification with springs varying considerably in other respects.

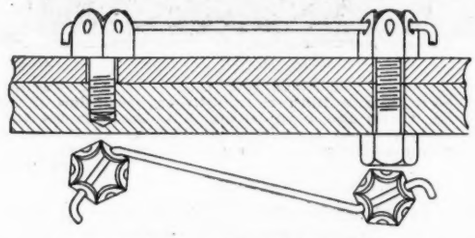


Compression charts for spring specifications

A Detroit manufacturer specifies coil springs by the use of a graph of compression per pound load. The drawing for the spring, instead of merely carrying the dimensions of the spring with load specifications, also include one of these graphs or charts of compression. A sample drawing for a valve spring is illustrated herewith. It will be noted that the pressure-compression graph is plotted for the range from 15 to 70 lb., which increase in pressure causes the spring to compress from 4 to 2 in. in length.

Crown Socket Screw and Nut Lock

A VERY simple device for locking nuts and screws against unscrewing has been placed on the market by C. E. Ashley. It consists of a hexagonal socket-shaped stamping with its six sides turned up and perforated near the top. The lock is placed under the nut or bolt head and after the latter is screwed home a wire is drawn through the holes in two of the sides of the socket. This wire, which also extends through holes on similar adjacent locking sockets, prevents the nut or screw from unscrewing. It would seem that the locking device is particularly applicable in cases where there are a number of screws or bolts close together, as in the covers of machinery cases, but can of course be used also with a single bolt, as a place to secure the wire to can practically always be found, and if not, can be provided.



Crown screw and nut locking device

Business Revival Evidenced by Specific Reports

All sections of the country appear to be sharing to a greater or lesser degree in the general revival of business. Increase partly seasonal but specific reports show an acceleration and improvement in all automotive lines which may be taken as indicating a more or less permanent condition.

FOR some time we have had indications that the automotive business is picking up; this improvement has been somewhat localized and hence not realized as being indicative of a general business revival. However, as these welcome signs have increased in number, they have lost their character of localization and have become indicative of fact rather than hopes.

Reports which come in from all over the country show that the industry has a great deal of sound business to look forward to. These reports give word of a factory taking on employees here, of heavy travel there, of an increase in orders and of definite increases in sales generally. The fact that they report hopeful signs from such a number of places and concerns changes the character of the items from one of rumor and hope to one of concrete fact.

The various news items which follow will indicate clearly the fact that business is proceeding well and that it is general throughout the country. Such items will doubtless be of more value and interest than a general statement of conditions because they do, in many cases, give specific facts which carry with them a certain amount of proof.

Middle West

Detroit.—Business conditions throughout the Middle West and Southwest are showing a decided change for the better, and this is having a strong tendency to improve the motor truck business, according to Vance H. Day, sales manager of the General Motors Truck Co., after an extensive trip through this territory. Cities visited included Chicago, St. Louis, New Orleans, Houston, Dallas, Salt Lake City, Lincoln, Denver and Kansas City.

Most of this business is coming from the industrial centers, he said, the farmers being responsible only for a small part of it. There are indications of strong business from the agricultural districts late in the summer, but this depends largely on the prices the farmer is able to command for his products.

The greater part of the business is for lighter model trucks, Day said. Buying in the heavy duty vehicles is light. The company will manufacture 1000 vehicles in April, and the May and June schedules are expected to be as heavy.

The company is making preparations for marketing its new bus which is now in production.

Minneapolis.—Dealers are making actual deliveries and one large distributor is several hundred cars behind orders at the factory. These are cars that are actually sold. While trainload delivery of cars to this territory has not been resumed, business is tending that way. One firm delivered 68 cars last week and has started in well this week. There is some trading in, but a lot is straight business.

In spots the bankers seem to be relenting and permitting dealers to get money to bring in cars, but sales to date seem to be among people who have had money but delayed buying of cars until spring.

Reports by travelers back from Montana on business trips carry the inference that there is much better feeling. With two copper mines resumed at Butte and between 6000 and 8000 men again at work, wool selling higher and a good crop planting outlook the financial feeling is better.

In general prices in the Federal banking district have risen for all grains except rye and all live stock except cows. Wool prices and sheep are strong in this advance. Wholesale trade is increasing as well as flour grinding.

Unemployment has decreased generally, crop acreage prospects are better, merchandise distribution has increased and there are fewer business failures. A survey by a St. Paul newspaper divulges the fact that less than 40 per cent of the farms in the Northwest outside Wisconsin are mortgaged. In Minnesota 60 per cent of the farms are free from debt, in North Dakota 61 per cent, in Montana 55 per cent and in South Dakota 45 per cent.

Moline, Ill.—Velie Motors Corp. will probably increase its daily output from 25 to 45 in the near future, due to the gain in demand.

"Our Cedar Rapids and Waterloo, Iowa, dealer reports that more farmers have been looking at cars in the last two months than in the ten preceding months," said H. T. Wheelock, advertising manager, in speaking of agricultural conditions. "Our Fort Dodge dealer points to banks in his city which have paid off their entire Federal Reserve indebtedness as indication of improvement in business and states that the automobile trade is reflecting this condition. Fifty per cent of the Iowa farmers are able to buy cars at the present time, and the outlook for the year is unusually bright."

Milwaukee, Wis.—The first half of April has witnessed a very satisfactory continuation of the progress made in March by manufacturers of passenger cars and makers of automotive parts and equipment of all descriptions in this center. The same is true of plants at Racine, Kenosha, Hartford and other Wisconsin cities having industries of this class. During the past week the Mitchell at Racine has increased its daily production by 25 cars and the demand from distributors and dealers is broadening steadily. Its force of 650 is being increased to 800 or 900. The H. & M. Body Corp., also located in Racine and making open and closed bodies principally for Hupmobile and Mitchell, has orders on the books to keep up capacity operations for eight months ahead and is adding a night shift. It is gen-

erally admitted that the situation of the automotive industries in this section is on the best footing it has occupied in more than eighteen months, and there has been no development in the last six to eight weeks to interrupt progress, as was experienced frequently last summer and fall. That is to say, the course of the improvement is steady and even and it is this tenor which lends so much satisfaction and encouragement.

Columbus.—With the coming of pleasant weather and a noticeable improvement in industrial conditions, demand for motor vehicles, particularly passenger cars, has shown a good increase. Dealers and distributors in Columbus and Central Ohio are much more encouraged over the outlook. There is a much better feeling among the farmers with prospects for a good wheat crop.

Cleveland.—Reports of Cleveland automobile dealers that there has been an influx of factory workers into the market for new and used cars in recent weeks is borne out by the record of employment in local industries as made public by the Chamber of Commerce.

Employment increased in six out of ten industries surveyed during March by the labor solution committee of the chamber. The record on March 31 was 2.1 per cent in excess of the figures for Feb. 28.

The iron and steel industry with an increase of 5 per cent in the number of employees made the greatest gain, while the automobile and parts makers showed an increase of 1.5 per cent. Food, textiles, lumber and smaller miscellaneous industries showed losses, occasioned by strikes and local conditions.

Cleveland.—The peak of the spring buying of automobiles in Cleveland has not been reached, say representative retail automobile dealers.

General business conditions bear out what the automobile dealers say. Banks here report that the first half of April proved the most promising period since 1920 from many standpoints. While it is true that part of the improvement is seasonal and another part is due to certain industries that have had an extra run of patronage, yet reports show that the whole economic machine is moving forward and gaining momentum rapidly.

The City Employment Bureau states that there has been a substantial reduction in unemployment. There are many other evidences of improvement such as prices of staple raw materials are advancing; production of iron and steel is on the increase; prices of stocks and bonds are higher; interest rates are falling and building construction is increasing.

In the automobile industry the evidence unmistakably shows improvement. The National Acme Co.'s Coit road plant is running to capacity. The Murray Ohio Co., maker of fenders and other parts, reports it is working ten hours a day six days a week. In other lines like the Owen Shops Co., maker of upholstered furniture, trouble is experienced in obtaining a sufficient number of qualified artisans.

A canvass of automobile dealers here disclosed that the first half of April has been better than the fifteen days of the preceding month. In fact, April has been the best month of the present year.

Los Angeles.—Throughout the Middle West and the West there is a marked improvement in business conditions, especially as affecting the automobile trade, declared Harry M. Jewett, president of the Paige-Detroit Motor Car Company, upon reaching Los Angeles.

"The farmers of the Middle West have considered themselves the hardest hit of any class in the so-called slump of last year," said Mr. Jewett. "They based their stand on the fact that they were not showing a profit on their investment, but the recent conference with Hoover at Washington sent them away with an entirely different understanding of their own situation. They had been figuring their percentages on wartime prices of land and products, and they had forgotten that the rest of us had been compelled to absorb millions in readjustment of inventory. Now they realize their mistake—and this, with the fact that snow and rains have assured them of bumper crops this season, has caused an opening up of the Middle West, such as has not been recorded since long before the war.

"The farmers really are in good shape financially and have the money to spend, but until recently they did not realize it. Now that they do, the Middle West is opening up—and the Middle West has been one of the most serious situations existent because of the widespread effect upon the rest of the country."

INDICATIONS are that the first improvement in business conditions, in so far as orders received are concerned, is coming from the industrial centers and that the farmers as yet are responsible for only a small part of it. That the farmer will appear in force as a buyer later in the year depending in volume on the prices received for his produce, appears to be the general opinion.

Decrease in unemployment, improvement in banking conditions and a general increase in the volume of orders and business actually transacted, give a favorable outlook for the automotive industry for the year.

Reports from the South

Atlanta, Ga. — Automobile sales in the Atlanta territory have improved steadily for the past thirty or forty days, and while considerably better than during the same period one year ago, there is still plenty of room for improvement. The principal demand at this time is for the low and medium priced cars, though many more sales of higher priced makes are being reported than during the early spring of 1921. Most of the dealers and distributors of Atlanta are looking forward to a fairly good business during the remainder of the spring and the coming summer.

One proof of improvement is noted in the records of the State automobile department, Secretary McLendon reporting that to date approximately 5000 more licenses have been issued than at this time in 1921. Up to April 1 of this year 94,000 passenger car licenses had been sold and 13,000 truck licenses or a total of 107,000. The 1921 total to April 1 was only 103,000.

As was the case last year most of the automotive sales are in the larger cities of the State, while business is still comparatively poor among the dealers in the smaller towns.

Truck sales are about on a par with those of a year ago and the outlook is not exceptionally bright, at least for the next few months.

Accessory and equipment sales are generally reported much better than the early part of 1921, with indications portending a fairly good volume for the next several months.

Tire sales also are much better than they have been in many months, and many of the dealers state they are experiencing almost normal business so far as tires are concerned.

Tractor and power farming equipment business continues at a low ebb, though somewhat better than it has been in the past several months. The outlook does not

promise material improvement until the next crop has been gathered at least, due to the low financial condition of the farmers in the southeastern territory.

Detroit.—Sales throughout the Southern States are increasing rapidly, reported G. H. Peasley, sales manager of the Olds Motor Co., after returning from a trip covering Chicago, Oklahoma City, Dallas, San Antonio, Houston, New Orleans and Memphis.

Louisiana and southern Texas are showing the best business, he said. Business conditions in western Texas are being greatly helped by rains, but too much rain may damage rice and other crops in eastern Texas and Louisiana. Sport models are in special demand throughout the territory, some cities being sold ahead.

To meet the demand on sport models from all sections of the country the Oldsmobile factory reports advancing May quotas to meet April demands.

Pacific Coast

Portland. — Portlanders who feel that the automobile business has turned the corner on the way to better days had their judgment vindicated to a considerable extent by the record for March, which in many instances was characterized as very good, and in practically all instances, with standard dealers, was better than March of last year. Dealers and distributors handling the standard lines all reported a good business, somewhat uneven, but still aggregating an excellent total.

One rather unexpected feature has been the increase in demand for the higher priced cars. Cars in the price class of $2,500 and above, which had not been moving to any extent, seemed to come to life again and, while figures are not available, it is estimated that this class of car was sold in better proportion in volume than for many months. One dealer in a popular make selling around $3,500 here reported that March this year was one of the best years in his history.

Eighteen sales of a popular car in the $1,000 class were reported one day this week. This is said to be the greatest number of cars of any one make aside from Ford ever reported sold here in one day.

New York State

Syracuse.—Increased activity in every branch of the automotive industry in this city is reported by factories and dealers. While few of the plants are on a normal basis, many of them have increased production within the last few weeks to such an extent that gear manufacturers and automobile makers and dealers are more optimistic than they have been in a year. The big gear plants are slowly getting back to normal, although it will be some months before all of them are on a full time basis.

Dealers report increased sales compared to the same time last year, and it is estimated that the number of automobiles in the county this year is at least 25 per cent greater than a year ago.

Franklin shipments for the week ending April 1 were greater than the entire month of February. The week was the largest of any in the last nine months.

Business in Canada

Toronto.—Automotive dealers in the province of Ontario report an excellent business which is steadily improving. March was the best month in the history of the Dominion Automobile Co., Ltd., distributor for the Essex and Hudson cars in Ontario. The same was true of the Toronto branch of the McLaughlin Motor Car Co.

The General Motors plants are working overtime with larger staffs than ever before. Ford is doing considerably better than last year and Studebaker has shown an increase every month this year, in spite of the fact that last year exceeded the peak production of 1920. The Durant jobs continue to receive much attention and patronage. Dodge Brothers is doing a very large business notwithstanding a flat refusal to accept trade-ins.

Montreal, Que.—Even the automobile dealers themselves are amazed at the big sales which they have been making in Montreal recently. Owing to the setback in general mercantile conditions, dealers were apprehensive regarding the sales they were going to be able to make this spring, and on this account made very limited reservations from factories. In face of this, one agency sold in the month of March alone fifty-eight new cars and twenty-nine used cars. In the case of the high priced models, sales for March are said to have run considerably ahead of the same month last year. If anything, however, it is stated that the French Canadian buyer is more largely represented this year than was the case a year ago.

Spanish Trans-Atlantic Air Service

A SPANISH-SOUTH AMERICAN airship service is being organized, according to the London *Times*. It is planned to have engineers trained in the works of the Zeppelin Company supervise the construction of the airships in Spain. In that country the whole of the building will be done, and the duralumin for the frameworks of the ships will be made there. Sites for aerodromes have already been taken over near Seville and Buenos Aires. Building will be begun next month.

Three revolving sheds will be put up at Seville, two large ones for the accommodation of three Zeppelin airships and a small shed to take a ship of less cubic capacity, which is to be flown to and from the Canary Islands for the instruction of Spanish airmen. The airships will be larger in volume than the R-38, and they will be driven by nine Maybach engines, each of 400 hp., four on either side of the envelope and one in the stern. The cabin will be placed forward. In it there will be quarters for the pilot and his staff, a saloon, a kitchen, and a smoke room. Much space for baggage will be provided along the keel. Forty passengers will be catered for, but it is intended to give the bulk of the available carrying space to mails. A single journey a week will be made each way between Buenos Aires and Seville and the fare will be about £200. The letter fee will be about 18d.

It is hoped to begin regular flights in approximately two years' time.

A new type of mooring mast is to be used for the new service. The main principle in its design is that the mast is built into a deep socket in the ground, in which it is sunk when not in use. For the purposes of mooring, the line dropped from the airship is attached to the coupling gear on the mast before the latter is raised from the socket. When the airship is secured the mast is raised, and by means of a door in a turret in the top of it connection is made with the forward end of the airship cabin.

Exports of Passenger Cars, Trucks, Tires, Tractors,

COUNTRIES	GASOLINE PASSENGER CARS						GASOLINE TRUCKS						PARTS	ELECTRIC PASSENGER CARS AND TRUCKS	
	Up to $800		$800 to $2000		$2000 and over		Up to 1-ton incl.		Over 1 to 2½-tons		Over 2½ tons				
	No.	Value	No.	Value	No.	Value	No.	Value	No.	Value	No.	Value	Value	No.	Value
Europe															
Austria													$112		
Azores and Madeira Islands													827		
Belgium	357	$121,177	6	$5,518	1	$2,275	120	$34,114	1	$1,257			7,303	1	$900
Bulgaria															
Czechoslovakia	1	435											435		
Denmark	10	7,240	5	4,674									91,427		
Finland													583		
France	10	4,661	1	2,000	1	3,270	2	748					171,555		
Germany	1	400	6	6,600					10	33,875			2,000		
Gibraltar															
Greece	9	3,817	1	1,605									2,717		
Hungary	2	936					1	389					167		
Italy													2,572		
Malta, Gozo, and Cyprus Islands	4	1,568											664		
Netherlands	55	37,778	6	6,374	4	19,000	24	9,294					1,503		
Norway			11	14,265									5,523		
Portugal													993		
Roumania													1,502		
Russia in Europe			1	1,500											
Spain	4	2,468	7	6,993									27,075		
Sweden	41	27,513	21	20,608									4,371	1	1,678
Switzerland			3	6,000									1,713		
Turkey in Europe			1	2,000									2,872		
England	14	8,498	13	13,750	5	23,500			6	5,865			394,295		
Scotland													14		
Ireland													69		
Jugoslavia, Albania, etc.			1	1,000									1,008		
North and South America															
Bermuda															
British Honduras													236		
Canada	236	144,367	249	299,591	51	156,726	3	3,478	53	61,029	5	$9,638	1,467,883		
Costa Rica													76		
Guatemala													3,015		
Honduras	1	527											3,060		
Nicaragua							1	1,400					136		
Panama	2	1,200	2	2,718			4	1,698					2,470		
Salvador			2	2,839	1	3,000							35		
Mexico	345	141,143	132	158,564	7	25,689	59	23,510	23	27,622	6	12,293	56,615		
Newfoundland and Labrador			2	2,758									2,359		
Barbados	1	600	1	972					1	680			2,861		
Jamaica	19	10,333	10	10,657			4	1,698	2	5,300			7,369		
Trinidad and Tobago	4	2,721	1	850									3,029		
Other British West Indies	12	5,894	2	2,100			2	849			2	6,900	1,627		
Cuba	41	22,627	20	32,324	4	17,548			3	2,948			20,332		
Dominican Republic	4	1,741	1	1,600									6,652		
Dutch West Indies	6	2,526					1	424					719		
French West Indies	1	435											904		
Haiti	16	8,472					1	424					6,830		
Virgin Islands of U. S.	2	815											87		
Argentina	13	8,826	66	68,391									247,494		
Bolivia													127		
Brazil	13	9,480	22	20,546	1	4,881							16,812		
Chile													10,448		
Colombia	5	2,009	2	2,831			3	1,274	1	934			9,132		
Ecuador													1,500		
British Guiana													466		
Dutch Guiana													980		
French Guiana	1	435													
Peru			2	1,912	1	3,000			1	1,211			6,664		
Uruguay	10	4,347	5	6,069									8,704		
Venezuela			1	1,125	3	10,500							2,190		
Asia															
Aden													81		
Ceylon	10	5,848	3	3,026							2	8,956	1,153		
China	19	14,187	10	9,340	2	4,920							5,623	5	2,675
Chosen	1	500											547		
British India	20	14,546	68	70,248			2	2,052					24,183		
Straits Settlements	2	550											3,566		
Other British East Indies													35		
Other Dutch East Indies													497		
Java and Madura			60	51,402					1	3,925	1	3,220	14,902		
French Indo China													456		
Hejaz, Arabia, Mesopotamia													574		
Far Eastern Republic															
Hongkong					1	2,600							594		
Japan	104	41,455	15	20,798	1	5,300	50	25,980	9	22,379	1	5,000	30,432	3	8,589
Palestine and Syria	42	18,720	13	12,501			2	1,000					2,767		
Persia													7,291		
Greece in Asia													97		
Siam													293		
Turkey in Asia															
Oceania															
Australia	311	192,353	164	175,815	20	80,000	7	8,855	17	25,450	6	10,240	51,886		
New Zealand	65	43,344	22	25,843	1	4,115			5	8,612			25,548		
Other British Oceania													432		
French Oceania													5		
Other Oceania													418		
Philippine Islands	25	12,504	21	18,841	3	6,889							5,772		
Africa															
Algeria and Tunis															
British West Africa	2	1,166							2	2,173			5,711		
British South Africa	20	13,199	113	115,190	3	6,950			6	6,944	4	8,100	36,252		
British East Africa	2	1,166											4,341		
Canary Islands	7	2,944	1	1,400									1,938		
French Africa	3	1,306											1,298		
Egypt	16	9,454	3	4,440									1,350		
Liberia													7		
Morocco															
Portuguese Africa	1	583											98		
Total	1,890	$958,814	1,096	$1,217,578	110	$380,163	286	$117,187	141	$210,204	27	$64,347	$2,840,259	10	$13,842

Motorcycles and Aircraft for February, 1922.

TIRES						FARM TRACTORS		PARTS	MOTORCYCLES		AIRPLANES AND SEA-PLANES		PARTS	COUNTRIES
Casings		Inner		Solid										
No.	Value	No.	Value	No.	Value	No.	Value	Value	No.	Value	No.	Value	Value	
														Europe
														Austria
														Azores and Madeira Islands
904	$17,368	637	$1,405			16	$7,698	$200	77	$21,349				Belgium
16	164	16	39											Bulgaria
														Czechoslovakia
1,014	15,348	276	606	78	$3,553			87	2	375				Denmark
														Finland
2,565	27,968	180	301			50	19,354	1,814	32	5,227				France
164	2,615	71	277	2	113				1	350				Germany
														Gibraltar
1,803	34,913	1,540	3,053	15	522	1	421						$50	Greece
						6	2,371	520						Hungary
568	7,875	472	891					425	87	23,010				Italy
44	591	8	31			1	423	80						Malta, Gozo, and Cyprus Islands
494	7,554	245	469	3	215			425	287	78,929				Netherlands
1,756	35,559	1,346	3,219						109	28,661				Norway
529	8,688	456	1,105											Portugal
240	5,999	50	195					41						Roumania
														Russia in Europe
929	13,065	231	635	8	697	1	375	31	59	16,473				Spain
1,285	21,179	891	800			1	400							Sweden
									20	6,555				Switzerland
						5	2,299							Turkey in Europe
17,951	220,820	6,509	9,834	178	5,424	1	676	3,258	25	6,333			5,141	England
														Scotland
								92						Ireland
		1,400	2,759											Yugoslavia, Albania, etc.
														North and South America
								19					77	Bermuda
6	90	4	15											British Honduras
4,730	63,703	5,988	18,228	176	6,294	73	51,418	18,810	35	8,858			382	Canada
63	1,355	37	74											Costa Rica
108	2,584	104	282	2	70				1	148				Guatemala
26	720	22	67											Honduras
4	114							629						Nicaragua
652	8,915	884	1,525	20	667			125	1	100			150	Panama
47	1,006	14	69											Salvador
4,397	71,769	5,814	14,554	261	9,972	19	16,395	37,189	9	1,726			1,199	Mexico
4	59							91						Newfoundland and Labrador
120	1,594	61	177											Barbados
942	13,008	880	1,440	137	3,326			47						Jamaica
211	2,847	127	321											Trinidad and Tobago
50	523	47	127											Other British West Indies
7,730	91,899	4,440	8,364	345	7,930	1	2,000	2,122	1	125				Cuba
196	3,681	238	424					200						Dominican Republic
67	922	68	101											Dutch West Indies
202	2,672	30	60	4	82			26						French West Indies
79	1,674	40	111											Haiti
91	1,352	90	140					584						Virgin Islands of U. S.
3,930	65,381	3,857	6,796	4	215			5,193	10	2,860			15	Argentina
41	1,547	83	249											Bolivia
817	11,398	450	797	10	143	1	671	781					18	Brazil
763	12,141	562	1,615	10	159			2,898						Chile
275	6,475	231	574	38	1,197	1	935	1,145	1	306				Colombia
204	3,719	158	295											Ecuador
84	916	185	293											British Guiana
														Dutch Guiana
														French Guiana
420	7,610	427	970	24	1,074			354					388	Peru
1,028	15,503	126	195	10	180	20	7,292							Uruguay
1,190	19,218	900	2,022	34	224			198						Venezuela
														Asia
12	249													Aden
78	1,884	51	138			2	300		1	400				Ceylon
														China
329	3,738	180	308	45	1,488	1	5,243	57	21	5,795				Chosen
1,190	15,584	1,121	1,892	309	6,300			9						British India
														Straits Settlements
								259						Other British East Indies
969	12,090			24	969			38	32	8,135				Other Dutch East Indies
														Java and Madura
268	5,852	82	209											French Indo China
58	1,531	58	169											Hejaz, Arabia, Mesopotamia
				20	440									Far Eastern Republic
267	4,863	75	200	176	3,172	1	1,975	688	18	4,400			1,200	Hongkong
1,314	3,115	208	506					103						Japan
														Palestine and Syria
														Persia
														Greece in Asia
														Siam
30	354													Turkey in Asia
														Oceania
1,065	14,481	875	1,782	220	7,139			188	120	33,316			565	Australia
1,111	21,591	496	1,669	70	2,407	15	8,713	1,023	11	3,140			905	New Zealand
8	145			2	77									Other British Oceania
13	175	2	4	3	109								34	French Oceania
														Other Oceania
1,740	24,245	2,177	4,569	160	4,075			1,269					22	Philippine Islands
						2	774	522	1	390				**Africa**
401	10,828	814	2,617											Algeria and Tunis
4,309	62,258	426	1,296					250	4	1,115				British West Africa
417	6,389	91	250											British South Africa
83	1,347													British East Africa
														Canary Islands
146	1,676							608	4	1,271				French Africa
														Egypt
240	1,971	105	188											Liberia
								17						Morocco
														Portuguese Africa
$73,787	$1,028,467	46,941	$101,301	2,388	$68,233	218	$129,733	$82,415	969	$259,347			$10,146	Total

Fundamentals of Labor Question Ignored

Efforts toward improving industrial relations largely abandoned. Control of labor through economic conditions only postpones the final settlement. Labor study tends to find an immediate solution to a specific problem rather than to understand fundamentals to achieve a permanent solution.

By Harry Tipper

A SURVEY of the country in the automotive field indicates very thoroughly the extent to which industrial relations efforts have been abandoned. Employment managers remain and in many instances these employment managers are attempting to improve the morale, conscientiously endeavoring to provide a better spirit among workers. They are hampered by the circumstances. In the fluctuating employment little can be done to improve the situation between the workers and their supervisors while, under the prevailing impression that labor is beaten, the desire for better relations and better understanding seems to have gone into the discard almost entirely. There is a widespread belief in manufacturing circles that labor is definitely beaten for a considerable time and that it is possible for the manufacturer to place himself in a position of virtual control again. This is the idea behind the refusal of the coal operators to confer with the miners in accordance with the terms of their agreement. It is also the reason for the general abandonment of work in industrial relations within the plant, the advocacy of the open shop, and the bitterness expressed in many quarters towards the unions. This attitude is all the more interesting in view of the past history since the industrial system began. Strikes have been defeated, unemployment has occurred and labor has been beaten many times during that history only to organize more carefully a little later on.

It is true, there is no actual necessity for placating the worker at this time. There is little necessity for worrying about the price to be paid, but that is not the point. As things are going to-day, the next era of more or less full employment will find the manufacturer as badly off as he was in 1920. He will learn practically nothing by his previous experience, and the general situation will not be improved in any large measure. When labor is scarce and wages high, the efforts of the manufacturer to establish decent industrial relations are viewed with suspicion. They are figured as part of the scheme to keep wages down. In other years they were suspected as a part of the deep policy of the manufacturer to undermine the labor organization. No such suspicion can attach to efforts that are made during a time like the present. There can be no element of self-defense in the study of the problem by the manufacturer, and such study is not likely to weaken the actual antagonism of the labor union as it would have done in 1920. The labor problem is not a temporary one. It is not concerned with the growth of this or that union or the payment of this or that wage scale. It is a perennial problem which has grown more acute as the industrial system has grown more complicated. It is not settled because a few strikes are beaten or because a few organizations are temporarily weakened. It can only be settled within the plant, and the operations of the plant management in this direction are still the most important operations for increased efficiency that can be made.

THE greatest waste of industry to-day is human waste and the great advance in efficiency will be made by an advance in orderliness and the lack of interruption and increase in working capacity of the individual. It is disturbing to find the manufacturers giving up all study of this kind so readily and lacking an apparent appreciation of its importance from a business standpoint. Reports from various parts of the country indicate that employment managers and general executives interested in the wage and labor situation believe that this is a matter of supply and demand and apparently believe that the alternate prosperity and depression will answer all the requirements in the relation between the management of a company and the workers.

The factory labor on an automobile varies from 15 to over 20 per cent in the examples which we have been able to secure. A reduction in the wage rate such as has taken place between 1920 and 1922 in the skilled trades will make some difference in costs, but it will not bring the economies required by the great reduction in prices. Prices are being made all along the line without any particular record for cost at the present moment. The raw material man, the man who is selling supplies and parts, all along to the man who is selling complete cars, have been cutting prices to meet the market and the adjusting costs as best they can. It is still possible to secure more reduction of labor cost per unit of production by the proper management of industrial relations than by a reduction of the wage rate, and, in the plants where the industrial relations have been amicable and carefully considered and there is a unity in the organization, reductions have been accepted or suggested by the workers without difficulty and the efficiency has been maintained or increased. The manufacturer can get by for the present moment of depression with his problems based upon supply and demand and control all the working conditions. Getting by will not

solve his problem, neither his cost problem nor his problem of a sufficient supply of skilled labor at all times on a reasonable basis, a lessened "turnover" and a greater efficiency.

It is evident that the apparent study given to the labor question in 1919 and 1920 was very largely due to the immediate question of looking for some special way of meeting the problem and not a desire to understand the question fundamentally so that it could be met, not for a year, but for any part of the life of the business. Skilled labor has not been reduced to the same extent as the unskilled labor in many lines and the reductions have been more uneven. The highly organized trades are resisting the reductions more successfully, and there is a great activity in workers' organizations not for immediate purposes but to secure an increased strength when the present acute problem has passed mostly away.

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This is not the case in Europe, where the desires and aspirations of the workers have proved to be of sufficient importance to demand attention before the industrial machinery can be set to work properly and kept in proper motion. The working of this law of supply and demand for 400 years in the industrial system has increased the number of adherents to workers' organizations from a few hundred to some thirty million in the various countries, so that it is not likely that the workings of this law will reduce either the number or the strength of such organizations. Moreover, industry is not concerned with ruling the worker. Industry is concerned entirely with securing the largest amount of work for the least possible amount of money per individual piece. It still remains that a company of men working in harmony with a community of purpose and ideas and some sound trust in each other can accomplish more at less cost than men who are working because it is necessary. This is the meat of the matter and it is only in this way that the full benefits can be secured by modern industry in the handling of its labor to economic advantage.

Headlight Tests and Regulations

A GREAT deal of interest is now being shown in regulations governing the headlights used by motor vehicles. The Bureau of Standards has assisted local authorities and the manufacturers through tests of these devices, and already quite a number of the states have framed laws to govern the use of lights on automobiles. The matter is one which should receive uniform treatment, and this has been recognized by nearly all those concerned in the subject.

In order to secure a satisfactory degree of uniformity in all parts of the country it will be necessary to have (1) uniform laws, (2) uniform procedure in the enforcement of the laws, and (3) an extensive campaign of education for enforcement officers, garage men and drivers of automobiles.

The establishment of headlight adjusting stations in garages has been found to be a very desirable step, and they have already been used in a number of states and cities under more or less definite official regulation. So far uniformity of legislation has been based upon the specifications formulated by the Committee on Motor Vehicle Lighting of the American Illuminating Engineering Society. These specifications have been adopted in practically the same form by nearly a dozen states. At the time they were formulated it was believed that the specifications were as rigid as could be enforced, but recently even more rigid regulations have been adopted in some sections.

In view of this situation, the above-mentioned committee decided that a revision of its specifications should be made. In accordance with this decision, the values specified for light on the road were considerably increased, while the limiting values, which are intended to control glaring light, were left unchanged. Other changes were also made.

With the idea of securing uniformity in the adoption of regulations, an informal organization of State authorities representing the whole of New England, New York, New Jersey, Pennsylvania and Maryland has been formed. Another meeting of this organization will be held at Harrisburg in April, and it is understood that an attempt will be made to establish a board of officers which will be charged with the approval of devices in all the states represented.

A RECENT letter from a resident of Brisbane, Queensland, Australia, which was published in the British paper *Motor*, tells some facts regarding the local automobile market which should be of interest to the American manufacturer. He admits that the State is almost entirely held by the "Yankee" product, but hopes that the English manufacturer will go after the market.

The fact that the American cars are almost entirely from the low-priced, light-car group gives an idea as to the type of car best fitted for that country.

He asks two leading questions:

1. Is the British manufacturer going to maintain his enthusiasm for the small car?

2. If he exports, will he take any interest in the product after it leaves his hands?

At present Queensland has suffered financially with the rest of the world, but the writer believes that the British light car would have a chance if pushed hard. He maintains that the following things must be done to insure any measure of success:

1. A reduction in price to make real competition with the American medium-power car.

2. Actual samples on the spot, vigorous advertisement via the press, active entry for all A. C. Q. events, such as hill-climbs, reliability tests, fuel consumption, and so on.

3. Genuine spare parts, standardization and, say, a six months' guarantee.

Each American manufacturer represented in Queensland should be able to tell in a measure what he has done and what he has left undone to win and maintain the market according to the writer's idea of what actions are necessary for the British manufacturer to succeed.

AUTOMOTIVE INDUSTRIES
The Automobile
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A Forward Step

A PRODUCT is manufactured at the lowest possible unit cost when the fullest powers of the various workmen as well as of the various machines are called into play. As the individual is made capable of assuming increased responsibility, the necessity for supervision and administrative expense decreases. While there has been a general tendency to disregard the production importance of these fundamentals during recent months, there are striking exceptions here and there throughout the industry.

The Oakland factory, for example, has in operation a plan which tends toward the better development of the capacity of individual workers and which operates to procure both better quality and cheaper production. The plan is explained in a bulletin issued by the company as follows:

"Every new employee is thoroughly taught the particular operation he is called upon to supervise. In addition he is taught the principles of the operation of the employee preceding him and also of the employee who performs the next operation after him. For every employee inspects the operation of the man preceding him before doing additional work and inspects his own work before sending it on to the next man. These inspections are made beside many inspections of the regular inspecting force. The thought underlying this system is not to have one employee discriminate against another, but to see that there is no let-down in quality of work done.

"The secondary result of this system is to keep on hand at all times a body of skilled mechanics. There are no green hands called upon to fill any position. All the men required for the most difficult positions are recruited from within the Oakland factories. There is ever a promotion of the older, more skilled employees to the higher positions. In like manner all the inspectors at the factories are chosen from among the men who have held several positions and who know from actual experience the kind of perfect workmanship that is required."

This is an excellent practical example of how the idea of developing the individual worker may be worked out. Such a plan does not solve the labor problem, nor was it installed for any such purpose. It does constitute a step in the direction of constructive progress. The idea behind the plan is based upon production practice and human psychology that is fundamentally sound.

Alcohol Fuel in Exported Vehicles

MANY automotive manufacturers are looking more and more to foreign markets to absorb a portion of their products and they are consequently interested in the conditions which must be met to satisfy customers in these markets. In all or nearly all countries outside the United States and Canada the cost of gasoline is so much greater than it is in this country that substitutes are frequently used and there is more incentive to consider the matter of fuel economy.

In Brazil and in the Spanish speaking countries of South and Central America, the West Indies and even in Hawaii and the Philippines alcohol is either being used or discussed as a possible future motor fuel. As might be expected, this fuel does not give entire satisfaction in vehicles designed to run on gasoline, even though it is, in some respects, a better fuel. Some of the reasons for this were set forth in an article entitled "The Use of Alcohol in Exported Vehicles," which appeared in AUTOMOTIVE INDUSTRIES for April 6. This article also gave figures showing how extensively fuel alcohol is already used.

Those who have made a study of the export market believe that cars, trucks and tractors especially fitted up to burn alcohol will find a ready sale. The changes needed in standard gasoline vehicles are not of a radical nature, but exact information as to the most economical compression ratio, the quantity of heat required for satisfactory vaporization, the most economical mixture ratio, and the best metals to resist corrosion is lacking, although some data on these points are available.

In short, the subject is in need of further study, and considerable research work is required before the best results are obtained. But the subject is not simply academic. It is of immediate practical interest and should be seriously considered by manufacturers who might well see that Congress appropriates funds to carry out research work on this and related subjects at the Bureau of Standards and in such other Government laboratories as are equipped for the work.

We shall welcome discussion of the subject in the Forum and be pleased to receive any authoritative data regarding the performance of automotive equipment using alcohol fuel. Interchange of information along this line will certainly benefit all concerned.

Will Distributor Study Markets?

MANUFACTURERS seem to be agreed that the distributor cannot be depended upon to secure comprehensive or accurate market analysis data. Consequently such essential work is being undertaken by the factories. This is necessary in view of the facts which must be faced.

Nevertheless, the factory will reduce the cost of its analysis work if efforts are continuously made to explain to the various distributors what it is all about, the practical value it has for them, and how they can use the results of such analyses in their selling effort. To do this will be extremely difficult in some cases and nearly impossible in others. It should be recognized, however, that in proportion as the distributor becomes interested and active in this work, the relative cost of carrying it on decreases from the factory standpoint. Moreover, the distributor is better able to carry on his work, sells more cars, and makes more money.

Distributors sometimes think that factory market analysis work is against them rather than with them. They have a suspicion that the factory is merely going through a lot of statistical gymnastics, purposely devised so that the distributor cannot understand them, with the idea of forcing him to take more cars than he wants—or in good times of keeping from him some cars that he does want.

From every standpoint it is worth while to continue the effort to sell the distributor on the idea of market analysis and market studies.

Two-Stroke Engines in Europe

RECENTLY there has been a notable increase of interest in two-stroke engines among European designers of passenger cars. In the British motorcycle field the two-stroke engine has always occupied a position of considerable importance, and from this field it is now forging its way into the cyclecar and light car fields.

Having had an extensive try-out in the United States and been discarded as a car engine, it is rather surprising to see the two-stroke turn up in Europe again, but if the situation is carefully analyzed the present European interest in the engine does not seem so illogical.

The two-stroke engine, in its simpler forms at least, has two shortcomings which led to its abandonment in this country. One is that it is less ecomonical of fuel than the four-stroke engine, especially if it is designed for operation at high speed and to this end provided with ports of considerable depth. The second is that it cannot be throttled as well as the four-stroke engine. Perhaps this latter disability should have been placed first, as it was undoubtedly the chief cause for its failure to satisfy car owners here. The cost of fuel was not as yet considered very seriously at the time of the two-stroke's decline as a car engine in this country.

The great advantage of the ordinary two-stroke engine is its simplicity, as a result of which it is cheap to manufacture and easy to maintain. Its inherent weaknesses, of course, are also closely bound up with this simplicity, and all attempts to overcome these weaknesses have resulted in complication, and thus at least partially eliminated the advantages over the four-stroke engine.

It is to be noted that the class of car for which European engineers are now selecting the two-stroke engine is the lightest and cheapest class which has to be built "to meet a price." The purchasers of these cars are not particularly exacting in respect to flexibility of the engine, and the simplicity of the design, with its entire absence of any valve gear, appeals to them. The lack of economy might be expected to be the greatest handicap of the engine, but the designers have concentrated their efforts on the elimination of this weakness and no doubt have succeeded to an extent. Quite a number of the engines are air-cooled, and air-cooling, in the estimation of many engineers, tends to greater fuel efficiency. All of the engines are small and therefore not great fuel consumers, and the advantages of low price and simplicity probably make a stronger appeal to the customer than a slight superiority in fuel economy would.

The Tractor Market

THERE are indications that the tractor business is picking up. Reports show a very healthy demand and a much greater interest in the possible purchase of them.

One dealer sent out a given number of letters to farmers, asking whether they were interested in the purchase of a tractor. This letter was sent out for three successive years and the replies tabulated. The results were as follows: Taking the year 1920 as a basis, in 1921 the number interested decreased 44 per cent, while in 1922 the number increased 329 per cent. This may be taken as a very good omen.

"There is many a slip 'twixt the cup and the lip" may be said in this case to mean, "There's many a slip b'twixt the interest and the sale," but if we know that the market is there and that the farmer's interest is backed up by an improved financial status then it is up to the tractor manufacturer to perfect his sales organization so that there may be as few slips as possible between the genuine interest and the bona fide sale.

Sales Keep Abreast of Factory Output

Production Still Speeding Up—No Large Surplus of Finished Vehicles Carried

By James Dalton

NEW YORK, April 18—With April more than half gone, manufacturers of motor vehicles still are speeding up production. There is every reason to believe the month will show a gain over March as was recorded by March over February. That was approximately 32 per cent and it was 65 per cent in excess of the preceding March.

Sales at retail, so far as can be determined, are keeping practically abreast of production. It is certain, at any rate, that no large surplus of finished products is being built up.

Up to this time the industry has been rather hesitant about accepting the theory that the country actually has begun the long swing back from depression and even now there is no disposition to abandon caution in commitments, but it is generally believed that any decline in sales this year will be merely seasonal.

Company after company is coming through with reports of greatly increased output for April. This applies to truck manufacturers as well as to those in the passenger car field. The largest producers of heavy duty vehicles assert that April orders will exceed any month since May, 1920. Makers of light trucks agree that business is excellent. Ford production is approaching capacity but the proportion of trucks turned out is much larger than it has been in many months.

Dealers Optimistic

Dealers everywhere are as optimistic as builders. Factory enthusiasm, in fact, is based solely on sales. Not only is there a strong demand for new vehicles, but the market for used cars is so strong that in most places they have ceased to be a sales deterrent.

Demand for motor vehicles is not peculiar to a few sections of the country but is practically universal. Even the South and the grain growing sections of the Middle West are buying in considerable volume. The farm market generally is steadily expanding, especially for commercial vehicles. The same is true of the industrial centers. Business in Canada is keeping abreast of the United States.

It is reported in a few of the larger cities that factory workers are beginning to buy used cars and inexpensive new cars. It is significant that the bulk of the passenger car buying is in the low and middle price classes. The percentage of increase in these fields is much greater than in the high price class although a few companies turning out comparatively expensive products are having the best business in their history.

Production in parts plants continues to gain rapidly and many of them are having the largest business in nearly two years. Several expect April to be the best month in their history.

Business in Brief

NEW YORK, April 18—Trade and industry generally continue their upward trend in spite of rains, bad country roads and strikes. The strike situation is no less serious and there are no indications that the mine walkout is any nearer an end than the day it was called. It has not yet affected industry, except iron and steel to a small degree.

The winter wheat crop has made a further gain notwithstanding an excess of rain. Spring seeding has been somewhat delayed by bad weather in some sections.

Export trade apparently has turned the corner. March recorded really definite gains.

Financial developments are practically all favorable. They include immense sales of bonds at steadily rising prices, sustained strength in the stock markets, more pronounced ease in money markets at home and abroad and continued strength in exchange rates.

Great improvement in buying of lumber, builders' hardware, cement, paints and other materials by the forward surge in construction activities is releasing huge sums of money and taking up the slack of unemployment.

Cotton consumption and exports are increasing in the face of the New England strike.

There is heavier buying of hides and leather.

The iron and steel industry has witnessed another buying spurt with advances in prices of many grades. Mills in the Chicago district are operating at 80 per cent of capacity.

There has been a very definite improvement in sales and credit conditions in the South.

POLAND FORBIDS CAR IMPORTS

NEW YORK, April 18—The importation of passenger cars and bodies now is forbidden in Poland.

Willys Is Optimistic on Return from Tour

Deliveries for Second Quarter Will Be Limited Only by Production Capacity

NEW YORK, April 17—The second quarter of 1922 would be the largest in the history of the Willys-Overland Co. if it could deliver all the cars for which it could get orders. It is estimated that sales of Overlands and Willys-Knights for the quarter will aggregate 37,000, but it would be possible to raise this number to 50,000 if that many cars could be turned out. This was a message brought to New York this week by John N. Willys after a seven weeks' trip in which he covered 18,000 miles, talked to 2500 dealers and all the distributors in the western territory.

While the company is in the unhappy position of not being able to take care of all the business it can get, there is no intention of departing from the conservative policy which has been in force at the Willys-Overland plant since the company began to recover from the depression. Willys would prefer a surplus of orders rather than a surplus of finished cars for which there is no market.

After his trip to the Coast by way of the northern route, then down through all the coast states and back to Toledo by the southern route, Willys was optimistic over the business outlook. In every section he visited he found a material improvement in general business conditions, resulting largely from increased prices for lumber, wool, livestock and agricultural products. The rapid return of confidence is, to him, the most encouraging feature of the situation. He believes that the relative prosperity which now is being experienced generally will continue, although he does not expect a boom.

Company's Affairs Improve

So far as Willys-Overland is concerned Willys is entirely confident. There still are a few difficulties to be ironed out, but the affairs of the company have shown an extraordinary improvement in the last few months. All possible losses have been taken, and operations are on a substantial basis, which undoubtedly will show a profit for the year.

After spending the week-end with his family here, Willys returned early in the week to Toledo, where he will spend most of his time in future. Although he has been on the road almost continuously for many weeks, conferring with distributors and dealers, this work will be continued for the next two months. The enthusiasm with which he has imbued the company's distributing organization has been reflected in the phenomenal business for the past five or six weeks. There is a strong demand for both Overland and Willys-Knight cars in all sections and Willys says they are giving entire satisfaction to purchasers.

Nash Will Direct Pierce-Lafayette

To Formulate Selling and Manufacturing Operations After Consolidation

NEW YORK, April 18—Detailed plans for the consolidation of the Pierce-Arrow Motor Car Co. and the Lafayette Motors Co. are being worked out following a conference of bankers and officers at which the plan was agreed upon in principle. C. W. Nash, president of Lafayette and of the Nash Motors Co., will become chairman of the board of the consolidated companies, while Colonel Charles Clifton, chairman of the board of Pierce-Arrow, will serve as president. Nash will have charge of all operations. He will shape the selling and manufacturing policies.

It is understood there will be no new financing in connection with the consolidation, as stockholders of both companies will exchange their stock for securities of a new company which is to be organized. No title has been selected for the new company, but it is intimated that the name of Pierce-Arrow will be retained. The banking house of J. & W. Seligman & Co. has been interested in the affairs of both Pierce-Arrow and Lafayette for some time, while Lee, Higginson & Co. have been interested in Lafayette. Both houses will be represented on the board of directors of the new company.

Better Production Facilities

It is understood one of the factors which led to the proposal to consolidate is to be found in the fact that the excessive manufacturing space of Pierce-Arrow can be utilized to turn out bodies for both Lafayette and Pierce-Arrow cars. Lafayette has been experiencing difficulty in obtaining satisfactory bodies for its chassis. Nash is quoted as having said that the Pierce-Arrow plant turns out the best passenger car bodies available.

The plans do not contemplate any immediate change either in the Pierce-Arrow or Lafayette lines. Both are in the higher class field. The Pierce-Arrow is powered with a six-cylinder engine and Lafayette with an eight cylinder. The Lafayette phaeton sells for $4,090 and the Pierce-Arrow for $6,500.

Pierce-Arrow has taken heavy losses in the last two years, but there has been a very sharp upward turn in its sales, both of passenger cars and trucks, in the past few months, and it is expected to show an operating profit this year. Lafayette also has been experiencing financial difficulties in the past few months, and some time ago asked for the cancellation of its commitments for materials. It was understood this step was taken at the demand of bankers.

Nash Motors will not be involved in the consolidation any more than it has been with the Lafayette company. Both are controlled by Nash. Until the merger is completed, Colonel Clifton will serve as chairman of the board and president of Pierce-Arrow.

Stockholders' Meeting Postponed

BUFFALO, April 19—The meeting of stockholders of the Pierce-Arrow Motor Car Co., which was to have been held at the plant yesterday afternoon, was indefinitely postponed because a majority of the stock was not represented. Nothing of a definite nature was announced regarding the merger of the company with the Lafayette Motors Co.

Myron T. Forbes, vice-president and general manager, issued a statement in which he said there was no announcement to be made at the present time concerning the merger and the plans for the future would not be discussed. He had just returned from a visit to the Lafayette plant at Indianapolis.

Amount of Truck Business Is Large Now and Capacity Volume Is Promised

By Martin L. Pulcher

Vice-President and General Manager of the Federal Motor Truck Co., and President of the National Association of Motor Truck Industries

Detroit, April 17.

IN this day of returning business in the motor truck industry it is of the utmost importance that the manufacturer take a long look into the future and make his plans accordingly.

The motor truck business is going to continue long after the day of many of the companies now in it. How long many of the present companies are to continue is largely a matter of their ability to analyze the fundamental requirements of the business and their capacity to meet them.

Most important of all considerations is the merchandising policy. Manufacturers without a strong selling organization or the ability to develop one might as well get out of business now and as quietly as possible. The best trucks in the world stored in the rear of any factory will never produce a cent of profit.

Trucks should be fathered almost in the sense that a child is and this fathering carried through until the truck has completed its mission as a business adjunct. It is not enough for the manufacturer to sell the truck to a distributor or the distributor to a user. Both manufacturer and dealer must be in position to help the owner keep it operating. Manufacturers unable to do this or manufacturers with dealers unable to do this are not operating on a basis sound in its possibilities for the future.

There is a large amount of truck business now and promise of capacity business soon. For the present, manufacturers are content to trail with this business rather than seek to control it. For this reason demand is running in excess of supply. As the trend of business becomes more definitely established the truck makers will meet the demand with spot deliveries. It is unwise to take chances on creating a surplus.

Factors making for truck business now are the rapid growth in building operations and the opening of extensive road building operations. Material prices in these fields are low. The number of idle freight cars is decreasing and some roads are placing orders for new cars. This means motor truck operations on both ends.

Practically all of the surplus war trucks have now been distributed, removing a serious sales resistance factor for the truck manufacturer. Used trucks do not exist in any quantity. War trucks shipped back from abroad in good condition have, for the most part, been sold. There is no market for the others. Steps have been taken to prevent any more coming back.

Taking all these factors into consideration, there remains only the question of continued restoration of general business. Indications are that it will continue its strides. Later on this year, with fair prices for farm produce, there will be large developments in this field.

With all these harbingers of business there should be no pessimism for motor truck manufacturers who are solidly established. Good trucks, sold right and properly maintained, will command the market.

Peerless March Business Approach High Record

CLEVELAND, April 18—Peerless Motor Car Co. shipments during the second week in March, including two entire trainloads, were exceeded only twice in the history of the company and then only by margins of eight and seventeen automobiles respectively. The total March business has been exceeded in only one previous March in the history of the company.

Monthly manufacturing schedules have been increased to keep up with the orders, and overtime is common at the factory.

When R. H. Collins came here as president and general manager of the Peerless company he set before his organization the task of producing and selling during the first six months of 1922 more than the entire total of Peerless production and sales during 1921.

$9,188,561 Is Sought from Lincoln Motors

Government Files Suit in Detroit Against Old Company on War Contracts

DETROIT, April 18—The United States government has filed suit for $9,188,561 in Federal court here against the bankrupt Lincoln Motors Co., which brought $8,000,000 when it was sold recently by the receiver to Henry Ford.

The suit was filed by Earl J. Davis, United States District Attorney, who received the papers from Washington. The government claims the amount asked in the suit was the sum which the Lincoln company was overpaid on war contracts for Liberty motors.

When the property was purchased by Henry Ford on Feb. 4, the debts of the company were estimated at $11,170,000, including a contingent liability of $1,500,000. The unsecured claims amount to $8,670,000.

Assets were carried on the books amounting to $15,061,492, but appraisal by the Detroit Trust Co. as receiver fixed them at $9,073,105 and the liabilities at $9,490,811.

The new Lincoln Motor Car Co. will not be affected in any way by the suit.

Will Press Suit

WASHINGTON, April 15—The government's claim against the old Lincoln Motor Co. will be pressed, it is asserted by Attorney General Daugherty after a conference with counsel representing creditors of the defunct company whose claims amount to approximately $9,000,000.

The creditors were represented at the hearing, over which Daugherty personally presided, by Harold H. Emmons of Detroit, acting for the Detroit Trust Co., receiver. There are approximately 900 creditors, Emmons said after the meeting, and to pay their claims there is available $5,000,000 out of the $8,000,000 paid by Henry Ford for the property. The other $3,000,000, he added, represented preferred claims, including labor, mortgages and city, state and county taxes.

The following statement was issued by Daugherty at the close of the hearing:

As was planned, a final hearing of the controversy involving the Lincoln Motors Co. has been held. It was participated in by a greater number of officials of the Department of Justice than generally participate in hearings of this character. It is customary upon request for the department to hear those against whom the government is pressing a claim as a matter of courtesy. This hearing was insisted upon by the receiver of the Lincoln Motors Co., an officer of the United States Court who represented more than 900 creditors.

The department thought it fair to grant this hearing under the special circumstances of the case. No time has been lost and no money has been lost to the government in affording an opportunity for this hearing. The hearing was concluded after a two hours' session and a decision was promptly reached that the government proceed in an orderly way to file and press the payment of this claim. It will no doubt promptly reach the Federal Court, where the whole matter of the liability of the parties will be determined.

Representatives of the War Department, the Department of Justice, the judge advocate's office, with legal and accounting counsel, participated in the hearing.

In a statement issued earlier in the week Daugherty declared that the case of the Lincoln Motors was brought out into the light through the desire of a former solicitor of the department to make trouble. The former employee referred to was H. L. Scaife, former solicitor and investigator, who had resigned because, he alleged, the government was not taking proper action to follow up evidence uncovered against the Lincoln and other concerns having contracts with the government.

(*Continued on page* 893)

Kelly Tire Eliminating All Its Own Salesrooms

NEW YORK, April 14—Consolidation of the general offices of the Kelly-Springfield Tire Co. at 250 West 57th Street, this city, was designed to organize more efficiently the executive branch of its business. A significant feature of the reorganization is that the New York branch has been moved to the company's warehouse at 553 West 57th Street, a step which is really equivalent to giving up the branch altogether since it now has no display rooms or sales counters.

The company explains its action on the ground that with the stabilization of the industry there is no need for the maintenance of these expensive establishments. With the discontinuance of all retail sales by the company, the factory branch was deemed a needless expense. This overhead burden will be eliminated in all cities as soon as practicable, and warehouses will be established in various centers of distribution where railroad facilities are best suited to give prompt service to dealers. In all these cities the branches will be supplanted by offices.

Reorganized American Bearings Buys Plant

INDIANAPOLIS, April 18 — The American Bearings Corp. has bought a factory building here from T. B. Laycock, Son & Co., manufacturer of juvenile bicycles. The negotiations are said to have been pending for some time. The bearings company has been installing machinery in the plant for two weeks.

The bearings company is a reorganization of the American Bearings & Die Casting Corp., which went into the hands of a receiver last July. Since the reorganization, it has been operating on another site in this city. The officers are Arthur Dixon, president; William Fletcher, vice-president, and Paul J. Moore, secretary and treasurer.

Frontenac Acquires Indianapolis Plant

Expects to Be Operating It Within 30 Days—To Make All Units There

INDIANAPOLIS, April 15—The Frontenac Motor Co. of America, which is to manufacture the new four cylinder motor car designed by Louis Chevrolet, has purchased the plant formerly operated by the Empire Motor Car Co. of this city. The plant was built originally and operated by the Federal Motor Co., and the purchase was made from that company.

Situated at Fifteenth Street and the Big Four tracks (Indianapolis), the plant affords more than 100,000 sq. ft. of space. The main structure is a one-story building of saw tooth construction, which will be used for machine shops and assembly. A three-story structure nearby will take care of the balance of the manufacturing plant. In addition there is a two-story office building which will house the executive staff.

Directors of the company state that work will begin at once to put the buildings in shape for production and that all necessary equipment and machinery has already been bought. Officials say they expect the plant to be in operation within thirty days. The first sample cars are expected to be ready by the latter part of May, and production in a limited way will be in process by the latter part of June.

William N. Thompson, president of the Stutz Motor Car Co., who has been prominently identified with the Frontenac company of which he is a director, says that when the Frontenac reaches full production more than 1500 men will be employed. He also says that all the units will be built in the newly acquired plant.

Guy H. Hall Will Direct Work of Tractor Bureau

CHICAGO, April 15 — The Power Farming Bureau, which was organized more than a year ago to promote publicity in behalf of tractors, has been succeeded by the National Institute of Progressive Farming. Guy H. Hall, best known to the tractor industry as secretary of the Kansas City Tractor Club and manager of the tractor shows held in Kansas City, is manager of the new organization.

The headquarters of the new organization will be in Chicago. It is supported by tractor and farm implement manufacturers and by organizations supporting progressive and diversified farming movements. The several cattle associations are for the first time joining with the manufacturers for a general advancement of the better farming idea. The plan is that the information developed and broadcasted by this organization will be constructive for farming and not in any sense the ordinary publicity type.

Packard Announces Its New Single Six

Produced in Two Wheelbase Lengths to Suit Different Body Types

DETROIT, April 20—The Packard Motor Car Co. released for publication today details of the new single six model which was announced in AUTOMOTIVE INDUSTRIES of February 9. The new model is now being produced in two wheelbase lengths to suit different types of bodies. The 5-passenger phaeton, 2-passenger runabout, 5-passenger sedan, 4-passenger coupe and 4-passenger sport models are mounted on 126 in. wheelbase chassis. The 7-passenger phaeton, 7-passenger sedan and 7-passenger limousine are mounted on 133 in. wheelbase. The prices are based on a list of $2,650 for the 5-passenger phaeton and $2,685 for the 7-passenger phaeton.

Mechanically, there is but little change as compared with the previous single six. In order to take care of the heavier bodies and to provide a standard engine for both wheelbases, one-half inch has been added to the stroke, making the dimensions for the power plant now three and three-eighths by five inches. Another slight change is the addition of one driving plate to the disk clutch, making this now a four driving plate type instead of three.

The bodies are characterized by long, low lines, accentuated by a bead strip which runs from the radiator around the entire length of the body and hood.

On the 5-passenger phaeton the tool compartment is in a space behind the front seat with curtains in left door pocket. On the 4-passenger sport, steel disk wheels are standard equipment. The tire equipment is cord 33 by 4½ in. on all except the sport model. Steel disk wheels are optional at $35 additional.

List prices of the new single six, f.o.b. Detroit, are as follows:

5-passenger Phaeton	$2,485
Runabout	2,485
Sport Model	2,650
Coupe	3,175
5-passenger Sedan	3,275
7-passenger Phaeton	2,685
7-passenger Sedan	3,525
7-passenger Sedan Limousine	3.575
"126" Chassis	2,250
"133" Chassis	2,350

These prices do not include freight or war taxes.

MANY AIRPLANES ENTER MEET

NEW YORK, April 18—More than 60 airplanes have been entered in the first of the national flying meets sanctioned by the Aero Club of America and the Aeronautical Chamber of Commerce, which will be held at Curtis Field, Garden City, Sunday, April 30.

PATENT CLAIM SETTLED

CLEVELAND, April 18—A claim of patent infringement against the General Motors Corp. has been settled by Frank A. Scott, receiver for the Standard Parts Co. By the terms of the settlement, the corporation has taken a license under patents Nos. 1,153,481 and 1,153,482, dated Sept. 14, 1915, relating to rims, and has paid approximately $25,000 for past infringement, this amount having been offset against the claim of the corporation against the estate of Standard Parts. It was contended by the Standard Parts Co. that the Jaxon Steel Products Co., a General Motors subsidiary, infringed the patents.

Monroe Incorporates with $500,000 Capital

INDIANAPOLIS, April 15—The reorganized Monroe Automobile Co. of Indianapolis has filed articles of incorporation here with capitalization placed at $500,000. The directors are William Small, J. H. O'Brien, F. A. King, J. F. Martin, and H. H. Alexander. Small is president and general manager; O'Brien, vice-president and executive manager, and Alexander is to be sales manager.

The plan is to sell direct to owners. Manufacture is to be continued at the old plant in this city, and the executive offices will remain at the same place. The company succeeds the William Small Co., which was sold at receiver's sale some time ago. Pending the reorganization the concern has been operating on the plan to be followed now.

Two Sections of S. A. E. to Hold Joint Meeting

NEW YORK, April 17—The Metropolitan and New England sections of the Society of Automotive Engineers will meet jointly at New Haven on April 21, when a paper will be presented by Prof. E. H. Lockwood of Yale University on "Power Losses from the Engine to the Road." The members of the Metropolitan section will go to the meeting in gasoline engined railway motor cars over the New York, New Haven & Hartford railroad.

On the same evening the Cleveland section of the society will discuss the matter of motor vehicle lighting, the paper of the evening being presented by H. H. Magdsick.

William F. Parish will discuss the dilution of crankcase oil at the meeting of the Detroit section on April 21, and will demonstrate a device to distill off the gasoline in the lubricating oil.

On April 27 C. T. Myers will read a paper before the Pennsylvania section, giving some notes on motor trucks.

PETERS MOVING TO NEW PLANT

BETHLEHEM, PA., April 17—The Peters Autocar Co., which has taken over the building formerly occupied by the Bethlehem Paper Co., is making rapid progress in transferring its equipment from the old plant at Trenton. The company is negotiating for the purchase of fifteen acres of land adjoining the building to provide for future expansion

Ford to Sell Truck Equipped with Body

"Three in One" Will Be Adapted to Several Uses—3-Ton Model Likely

DETROIT, April 18—The Ford Motor Co. will begin late in the summer to supply its one-ton truck, equipped with body complete, as well as the stripped chassis. The design of the body has not yet been definitely determined, but it will be a combination type practical for several uses. "Three in one" is the way one factory official described it.

It is probable Ford will enter the three-ton truck field late in the summer. This is dependent largely upon the development of business generally up to that time and the consequent probable demand for trucks. The company has mapped out definite plans to go into the heavy truck field, but they have been delayed temporarily.

Models of GMC Truck Made in Two Wheelbases

PONTIAC, MICH., April 15—The 2, 3½ and 5-ton GMC trucks are now being made in two wheelbases, the standard length models being designated as A and the longer models as B. The other chassis details remain as before, except for changes necessary to the longer construction. The prices of the models are:

Model	Wheelbase	Price	Capacity
K16	Standard	$1,495	1-ton
K41A	Standard	2,775	2-tons
K41B	Long	2,775	2-tons
K71A	Standard	3,950	3½-tons
K71B	Long	4,050	3½-tons
K101A	Standard	4,350	5-tons
K101B	Long	4,450	5-tons

KREBS-COLLIER TRUCK

BELLEVUE, OHIO, April 17—A line of trucks to be known as the Krebs-Collier will be built by the Collier Motor Truck Co. for the Krebs Motor Truck Co. The capacity and prices of the new models follow: ¾-ton, $1,260; 1-ton, $1,565; 1½-ton, $2,125; 2½-ton, $2,375; 3½-ton, $2,975.

BRINGING OUT NEW TRUCKS

CEDAR RAPIDS, IOWA, April 15—The Beck-Hawkeye Truck Works is bringing out two new models, a 2-ton C-40 to sell at $2,150 and a 2½-ton D-50 to sell at $2,850.

PRIVATE OWNERSHIP IN RUSSIA

NEW YORK, April 17—A dispatch from Moscow says the Council of Commissars has restored the right of private ownership of automobiles in Russia, and it is announced that the importation of motor vehicles and accessories will be permitted through the Foreign Trade Commissariat.

Creditors to Handle Assets of Owen Tire

During Stormy Meeting They Elect Attorney as Trustee to Supersede Receiver

CLEVELAND, April 15—Creditors of the Owen Tire & Rubber Co., at one of the stormiest meetings of claimants ever held in this city, took charge of the assets of the corporation, which came into existence here during the hectic days of the war.

The creditors elected Charles Higley, an attorney-at-law, trustee, and authorized him to take charge of the plant. M. M. Scott, who has been acting as receiver, filed his final report and was superseded by Higley.

There came into the meeting, which originally was scheduled to be held in the office of C. D. Friebolin, referee in bankruptcy, men and women to the number of 200. The meeting had to be adjourned to the old court house to accommodate the crowd. Among them were men and women whose life savings had been wiped out. They had drawn their savings from the bank and invested in stock of the company with the conviction that it would double and possibly treble, as everything was soaring in those days.

Dream of Wealth Gone

Their dream of wealth was shattered when the plant was closed down, but that shock was nothing like the one received at the meeting of creditors, to which many of these stockholders came.

This is what they learned: Men and women in Cleveland and northern Ohic had purchased approximately $2,250,000 worth of stock. To-day the assets of the company consist of the plant and its machinery, worth possibly $400,000. There are a number of suits pending in Common Pleas Court against officers and directors in which approximately $300,000 is asked to be returned to the company. These suits set forth a story of large sums paid out as dividends when the company was not earning a surplus; of architects fees paid an officer of the company; of real estate belonging to the corporation that was taken over by officers of the corporation, and of extravagances practiced during the short time the plant was in operation and stock was being sold.

Against the plant and its machinery and the amount that may be realized from the pending suits, creditors at the meeting presented claims totaling $900,000.

TORBENSEN AXLE REORGANIZED

CLEVELAND, April 17—Reorganization of the Torbensen Axle Co. has been carried through by J. O. Eaton, its former president and general manager, backed by Cleveland financial interests which acquired the interest of the Republic Motor Truck Co. in the axle corporation. Under the reorganization plan the company will have 80,000 shares of common stock of no par value, which will be exchanged for the former Torbensen preferred stock on the basis of four shares of the new common for one of the old. A block of the common has been underwritten to provide working capital.

YELLOW MAY REPLACE RED FOR TAIL LIGHT

NEW YORK, April 18—A bulletin sent out by the Society of Automotive Engineers states that serious consideration is being given to the advisability of using yellow instead of red tail lights to minimize the danger of motorists confusing with tail lights the lights placed along highways to indicate dangerous road conditions. This is held to be the cause of many accidents.

United Auto Stores Assets Ordered Sold

PHILADELPHIA, April 15—Public sales of the assets in the stores of the United Auto Stores, Inc., located in the eastern district of Pennsylvania, have been ordered by United States District Judge Thompson. Application for the sales was made several weeks ago, but the court took the matter under advisement on account of pleas of the stockholders for a postponment until they should have time to consider a proposition for reorganization.

While Judge Thompson's order applies only to the assets in this district, similar orders will be sought in the Federal courts in those districts where the other stores of the concern are located. Francis F. Burch and Samuel A. Whitaker, receivers in equity, asked for the sale on the ground that every one of the stores was losing money in operations, and that unless a public sale were ordered at once, the assets practically would be consumed by accumulations of rent.

The merchandise assets in the 58 stores the company maintained were inventoried as of Dec. 31, last, at a valuation of $221,000, while the fixtures cost the company $1,000 for each store.

NEW CHASSIS SPRING

SPOKANE, WASH., April 15—A new type of chassis spring without center bolt has been invented by F. J. Laher of the Laher Auto Spring Co. of this city. Laher welds side clips to the leaves to hold them together, this welding being done by the electric arc process. The side clips naturally prevent the leaves from shifting laterally, but it was also found that, although no center bolt is used, there is no need for humps or other substitute methods to prevent endwise shifting of the leaves.

Will Sign Barnsdall As New Fuel Licensee

Contract Involving Ramage Process to Be Entered Into with Syndicate

DETROIT, April 15—Contracts will be signed this week between the Chemical Research Syndicate, Ltd., headed by F. F. Beall, vice-president of Gray Motors Corp., and the Barnsdall Corp. of New York, by which the latter company will become the sole licensee in the United States and Mexico of the hydrogenation process perfected by Dr. A. S. Ramage, by which low grade fuel oils may be converted into motor spirit.

The Barnsdall Corp. has been testing the Ramage process for over a year to decide its commercial possibilities. Its recent annual report indicates an average yield of 70 per cent of motor spirit from the semi-waste oil products.

Under the contract to be signed, the interests of the automotive industry will be fully protected as to minimum supply of the new fuel to be produced, Beall said. Though the Barnsdall company will be sole licensee it will be empowered to license other companies, and will do so where its own facilities are inadequate.

Leading members of the Chemical Research Syndicate, Ltd., besides Beall, are J. B. Weaver, vice-president of the Pullman Co., Chicago; Benjamin Briscoe, former president of Briscoe Motor Corp.; Dr. Ramage, inventor of the process; H. H. Emmons, Detroit attorney, and Rudolph Stahl of Briscoe & Stahl, consulting engineers.

The offices of the syndicate will be continued in Detroit where research work and experimentation will be continued by Dr. Ramage in semi-waste oil products.

New Obenberger Forge Works on Organization

MILWAUKEE, April 17—The Obenberger Forge Co. of West Allis, Milwaukee County, has been incorporated with a capital stock of $250,000 by the secured creditors of the defunct John Obenberger Forge Co. of Milwaukee, who recently purchased the entire assets, appraised at $980,000, for $48,000 in cash and assumption of secured claims amounting of $188,000.

The new corporation is perfecting its organization with a view to resuming immediately the operation of the big drop forge works at West Allis. The incorporators include L. J. Klug of Klug & Smith, consulting and contracting engineers; B. A. Stenz and B. Hoffmann, Jr., head of the B. Hoffmann Manufacturing Co., all of Milwaukee.

FRENCH TO SHOW AIRCRAFT

NEW YORK, April 15—At its last meeting the French Syndicated Chamber of Aeronautical Industries decided to hold an aircraft show this year.

Casing Production Gains Over Last Year

Shipments Also Increase—Lower Inventories Carried Except of Inner Tubes

NEW YORK, April 18—Statistics of the rubber industry for the first two months of the year as compared with the same period in 1921 show a very material increase in production of pneumatic casings, inner tubes and tires.

Notwithstanding this fact, inventories for both months were considerably less except in the case of inner tubes, which show stocks on hand at the end of February larger than at the close of either January or February, 1921. Shipments were materially larger, but the gain was not so great in comparison with last year as in the production field. Tire production for the first two months of the year was running at the rate of more than 24,000,000 per annum.

Details for the two months of 1921 and 1922 follow:

PNEUMATIC CASINGS

1921—	Inventory	Production	Shipments
Jan.	5,319,605	703,430	965,417
Feb.	5,193,018	819,892	1,073,756
1922—			
Jan.	4,174,000	2,055,000	1,597,000
Feb.	4,691,000	2,084,000	1,562,000

INNER TUBES

1921—	Inventory	Production	Shipments
Jan.	5,586,163	740,824	1,042,617
Feb.	5,415,464	916,627	1,129,881
1922—			
Jan.	5,247,000	2,343,000	1,890,000
Feb.	6,142,000	2,597,000	1,703,000

SOLID TIRES

1921—	Inventory	Production	Shipments
Jan.	303,753	21,220	29,116
Feb.	304,374	23,365	29,599
1922—			
Jan.	182,000	40,000	33,000
Feb.	183,000	39,000	37,000

"Production" and "Shipments" figures cover the entire month for which each report is made. "Inventory" is reported as of the last day of each month.

"Inventory" includes tires and tubes constituting domestic work in factory and in transit to, or at warehouses, branches (if any), or in possession of dealers on consignment basis, and as a total represents all tires and tubes still owned by manufacturers as a domestic stock.

"Shipments" includes only stock forwarded to a purchaser and does not include stock forwarded to a warehouse, branch, or on a consignment basis, or abroad.

Durant and Gray Start to Add to Factory Space

DETROIT, April 15—Two large additions to existing motor car plants were put under way this week when the Durant Motor Co. broke ground for an addition to its Lansing factory which will give it a capacity of 400 cars daily for the Star car, and the Gray Motor Corp. signed contracts for the building of an assembly structure on its Detroit site with a capacity of about 200 cars a day.

Manufacture of the Star car will start at the Lansing plant in the present buildings during May. The first shipments of the Gray car have been fixed for May 15. Manufacture of engines for the Star car is now under way in the Continental Motor Corp. factory at Muskegon, and manufacture of engines for the Gray car is under way at the Gray engine plant, Detroit.

Contracts have been signed with the Auto Body Co. of Lansing for the manufacture of the open car bodies for Star cars made in the Lansing plant. In addition to its Star car capacity, the Lansing plant will have capacity for 200 Durant four-cylinder cars daily.

CALL FOR FARM HELP GREATER THAN SUPPLY

MILWAUKEE, April 17—For the first time in nearly two years, the demand for farm help in Wisconsin is in excess of the supply, according to a statement issued by R. G. Knutson, state director of the Federal employment service in Wisconsin.

This condition strikes the manufacturers, distributors and dealers in farm operating equipment of all descriptions as probably the most encouraging they have heard about since the slump in prices of farm products generally induced a sharp depression in equipment sales.

During the latter part of 1920, all through 1921 and until a few weeks ago, farmers in Wisconsin maintained that they could get all the manual assistance they wanted without resorting to mechanical economies.

Tentative Plans Drawn for Bus Standardization

NEW YORK, April 17—The Engineering Committee of the American Electric Railway Association has drawn up tentative plans for standard motor bus construction. Proposed dimensions for the three sizes of chassis are:

No. of passengers	21	25	29
Wheelbase (inches)	156	176	196
Engine (horsepower)	30	40	50
Tread, front and rear (in.)	66	66	66
Capacity of rear (tons)	2	2½	3
Braking surface (sq. in.)	150	175	200
Approx. maximum weight (lb.)	4500	5000	5500

Other recommendations are:

(a) Low-hung type of chassis frame with a maximum frame height of 26 inches, preferably lower.
(b) Spring suspension.
(c) Engine preferably of either poppet or sleeve valve type with maximum speed not to exceed 1300 r.p.m.
(d) Gear ratio not to be less than 7 to 1 and not more than 12 to 1.
(e) Metal plate or spoke wheels.
(f) 34-inch solid or semi-solid tires; pneumatics where low floor height not desired.

TAX YIELDS $1,057,767

HARRISBURG, April 15—The State of Pennsylvania has realized $1,057,767 from gasoline taxes during the first six months of enforcement of the new tax.

To Plan Year's Work at Aviation Meeting

Development of Type of Engine Eliminating Fire Hazard Will Be Discussed

WASHINGTON, April 19—A program for aeronautical research and development for the coming year will be considered by the members of the National Advisory Committee for Aeronautics at its semi-annual meeting to be held in the Navy Building to-morrow afternoon, April 20.

The committee, which is headed by Dr. Charles D. Walcott, is composed of independent and governmental scientists and engineers. The scientific research and development undertaken during the past year in both civil and military aviation will be reviewed. Problems of airplane wing design, new developments in aeronautical engines, methods of testing airplanes, wings and parts, airship studies, lifting gases, aerial routes, the air mail service, and problems for the advancement of commercial aviation are among the subjects to be discussed.

Dr. Joseph S. Ames, chairman of the executive committee, will outline the future plans of the committee with a view to placing America "foremost" in the development of aviation, as President Harding has recommended to the Congress.

The development of a new type of aircraft engine with a view of eliminating the fire hazard by the use of heavy fuel oil in place of gasoline, will be among the subjects discussed. Special studies and tests of a new high-speed airplane wing, believed to be of great value in the interests of military scout planes, will be recounted by Dr. Ames.

Commercial Aviation Bill Is Introduced in House

WASHINGTON, April 17—Representative Steenerson has introduced in the House a bill designed to encourage commercial aviation and authorizing the Postmaster General to contract for air mail service.

It prescribes rates of transportation and postage. The postage rate, under the bill, would be not less than 6 cents per oz. or fraction thereof. The Postmaster General would be authorized to contract with any individual, firm or corporation for the transportation of air mail at a rate not exceeding two mills per lb. per mile, and to contract either for the transportation by aircraft of first class mail other than air mail at a rate not exceeding ½ mill per lb. per mile.

A similar bill offered by Representative Kelly of Pennsylvania would fix the rate of payment for transportation by air mail at 1 mill per lb. per mile. Both measures have been referred to the Committee on Post Office and Post Roads.

Seeks to Minimize Acute Unemployment

Conference at Washington Shows Work Done by Chamber of Commerce

WASHINGTON, April 14—Manufacturers, trade association executives and members of the national conference of Business Paper Editors met yesterday with Secretary of Commerce Hoover, to discuss means of collecting and disseminating information intended to prevent or minimize the periodic recurrence of depressions and acute conditions of unemployment.

The meeting was in charge of Joseph H. Defrees, president of the United States Chamber of Commerce, assisted by Dr. Wesley C. Mitchell, director of the Bureau of Economic Research of the Department of Commerce. Representatives of the N. A. C. C. and M. & A. M. A. and the Rubber Association of America were present. Dr. Mitchell's bureau is working with a special committee of the Chamber of Commerce to collect unemployment information.

Dr. Mitchell explained that it was hoped to prepare a study which would contribute to trade stabilization of production, by finding out how some manufacturers have done this and by analyzing this information and putting it before manufacturers generally in a form which they could apply to their own problems. Dr. Mitchell said that the further fact that some manufacturers had been able to avoid sharp curves in the employment situation indicated that others probably had done the same thing.

Data to Be Analyzed

It was the object of the investigation, he said, to search out all such instances possible and to assemble and analyze comparable data on the subject. Among other things he said the Russell Sage foundation had been asked to assist in getting up a better system for reporting unemployment statistics.

During the discussion it developed that some progress already had been made in obtaining information on suitable methods of some manufacturers and on learning the effect of their policies on production, sales, inventories, employment, costs, etc.

The bureau hopes by fall to present a report on its investigation, and in the meantime wants all the assistance available from trade assoications and individual manufacturers and wholesalers on means of getting the desired information and on methods of popularizing the study so that practical use can be made of it when it is complete.

EMPLOYMENT RECORD FOR YEAR

DETROIT, April 17—The Employers' Association has reported an increase of 4345 in total employment for the week and a decrease of 14,113 in the number of men working part time. The net gain is 321,464 payroll hours over last week and establishes a new high record for the year. Of the 79 members of the association, only eight shops are on a part time basis. Total employment of the organization amounts to 140,734, compared with 96,000 during the corresponding week last year and 198,000 during the same week of 1920.

Racine Factory Feeling Skilled Labor Shortage

RACINE, WIS., April 17—For the first time in about a year and a half a manufacturing industry here has experienced the sensation of being unable to enlarge its operations because of the lack of skilled workmen. The industry is the H. & M. Body Corp., owned jointly by Hupp and Mitchell. It is seeking enough men to put on a full night shift, thus bringing up its output of open and closed bodies by 65 or 75 per cent. It has orders on its books to keep the plant busy at capacity more than eight months.

Other members of the automotive industry in Racine are experiencing a growing patronage, which is forcing extension of working schedules and forces. The Mitchell Motors Co. has increased its output by 25 to 30 cars a day within the past week by adding 200 men to its payroll, now in execess of 850.

Foundries and machine shops in Racine catering to automotive and agricultural equipment manufacturers are averaging 75 to 85 per cent of normal in operations. The tractor business is slowly but steadily advancing to the point where new production on a fair scale is in sight.

Exports from Germany Show Big Drop in 1921

WASHINGTON, April 18—Automobile exports from Germany during 1921, totaling 8840 motor vehicles, show a big drop, compared with the previous year, when 17,534 automobiles were exported, according to figures received by the automotive section of the Department of Commerce.

The exports were to the following countries, in the order named: Holland, Sweden, Spain, Belgium and Denmark. The exports of the last three months of 1921 were the only ones to show an increase as a consequence of the Berlin Motor Show.

GRANT TO IMPROVE POSITION

CLEVELAND, April 18—The Grant Motor Car Corp. has sent a letter to its stockholders informing them that negotiations are well under way whereby the company's financial status will be materially improved by the sale of its interest in the H. J. Walker Co., which manufactures engines. A full report of this transaction will be sent out later. The usual statement of the company's affairs for the year has been delayed because the annual audit has not been completed.

Ireland Will Offer Big Market for Cars

Demand Estimated at 30,000, Mostly Low Priced Products, Following June Elections

DETROIT, April 17—Ireland will be in the market for 30,000 motor cars a year following the establishment of its government in the June elections, according to Harry B. Huet, one of the big distributors of that country who is in the United States on a buying trip. Huet has acquired the sole sales rights in Ireland for the Gray car and the Seiberling tire.

Most of the Irish demand will be for cars in the low price field, owing to high costs of upkeep and the inherent economy of the people, he said, with only a scattering of business in the higher price classes. Price is the biggest consideration, and with high import duties and high ocean freights only cars in the low price fields can reach the big market.

Money is plentiful in Ireland, Huet said, but is not in great circulation as yet, owing to the recent troublous period, but the markets are gradually opening. Since 1916 products have commanded high prices which latterly have diminished to a certain extent, but are still yielding a large return. This is especially true of the farm products of the South.

Poor Railroad Service

The truck market is very good because the country is poorly served by its railroads, he said. There are plenty of good roads, and a start has been made toward the construction of more highways and better ones by the appropriation of more than $1,500,000 for this work to begin at once.

Huet said he represented only one of many hundreds of dealers who will soon be in America looking for sales rights in Ireland. There is a warm feeling in Ireland for American products, he said, and where prices can be met there should be a large demand.

Tractors are in small demand, Huet declared, because the farms are for the most part too small to warrant their use, and, also, that the Irish farmer is not a mechanic and unable to keep his machine in constant use. Serious strides are being made by the Ford interests to educate the populace in the use of the tractors, but with indifferent success thus far, he said.

Huet estimated the total number of registered cars in Ireland to-day at approximately 60,000, practically all of which have come in since 1914.

CHARLES F. MOLLEY DEAD

READING, PA., April 18—The American Boron Products Co., Inc., makers of copper alloy metals, announces the death of Charles F. Molley, its vice-president and general manager.

Durant Again Asked to Buy Willys Plant

Offer Made to Pay $4,000,000 in Notes for Corporation's Elizabeth Property

TOLEDO, April 19—Frank P. Kennison, one of the receivers of the Willys Corp., said to-day that the receivers and attorneys had again been in communication with W. C. Durant in an effort to persuade him to take over the Elizabeth, N. J., plant. The proposal made was to accept in payment $4,000,000 in notes. The cost of the plant was approximately $10,000,000.

"We have been at work on plans to provide for the liquidation of the assets of the corporation over a period of time and thus avoid any forced sale," Kennison said.

It is believed this is the reason for the recent advance in the price of the first preferred stock. The New Jersey Federal court has decreed that the sale of the Elizabeth plant shall be made in 60 days. Durant is the only possible purchaser considered seriously thus far.

It has been agreed that the Federal court in Toledo shall be the center for the legal entanglement for the Willys Corp., but the bankruptcy suit filed in New York will have to be cleared away first.

There was a Willys Corp. "field day" in court here yesterday. Attorney Joseph P. Cotton appeared for the first preferred stockholders' committee, E. Bisbee for the bank creditors' committee, Col. J. M. Hatfield for the merchandise creditors' committee and D. H. Miller, Thomas Tracy and E. J. Marshall for the Ohio receivers.

All the committees, with the exception of the bank creditors, have approved the sale of the Electric Auto-Lite Division, including the Toledo and Fostoria plants, at the upset price of $4,500,000. Bisbee said he would have to have authorization from his committee before he could approve the move. The Federal tax claim against the corporation stands in the way, in his opinion, and should be determined first.

Claims Total $24,000,000

TOLEDO, April 13 — That claims against the Willys Corp. will total more than $24,000,000, but that only $12,000,000 will be admitted as valid, was stated in a motion filed by attorneys for the Ohio Savings Bank & Trust Co. here asking for the sale of the Electric Auto-Lite division to pay valid claims. The motion filed was accompanied by an inventory of the Electric Auto-Lite division signed by the three receivers, Frank P. Kennison, C. O. Miniger and F. G. Caffey.

This inventory shows that the property of the Auto-Lite Corp. is worth about $4,210,000, divided as follows:

Total factory inventory of the Toledo plant, $2,137,425.71; land, $125,793; buildings and equipment, $509,821.34; machinery and equipment, $1,200,550; furniture and fixtures, $38,663.26; Willys light division, $18,098.64.

The report says there should be deducted $564,228.43 for depreciation, leaving a total of $1,696,915.47 as the present value of the property inventory.

The value of the Fostoria plant is given as $209,817.28 and that of plant number six as $167,943.68.

Auto-Lite Business Satisfactory

"In order to pay the valid claims, it will be necessary to sell the property in the Toledo federal district," the motion says.

It is stated that the Auto-Lite has been conducted practically as a separate concern. Business is reported very satisfactory.

There are 30 acres with factories and equipment near Poughkeepsie, N. Y., which parcel of the Willys Corp. is considered an integral part of the Auto-Lite and the motion recommends that this be sold also. Consent of the New York Federal court jurisdiction would have to be obtained.

Gary Assets Bought; New Company Formed

GARY, IND., April 18—The assets of the Gary Motor Truck Co., which has been in receivership for several months, have been purchased by Frank Dawson and three associates, who will reorganize the corporation under the name Gary Motor Corp., with a capital of $1,000,000. Dawson is president and general manager of the new company. He also headed the old company.

T. H. Cooper, who was Kansas City distributor for Gary trucks, is secretary and treasurer; John Griffin is vice president, and Harry Searle is the fourth director. The property was purchased at trustee's sale for $110,000.

Dawson announced that the company would continue the same line of trucks that the old company manufactured, at reduced retail prices, and would add a light delivery truck to be sold at a popular price. Following the sale, the factory was reopened and a number of men put to work. It is planned to distribute the trucks through branches to be opened in the larger cities.

The schedule of prices is as follows:

Model	Old Price	New Price
F 1½-ton	$2,600	$1,675
I 2-ton	2,900	2,150
J 2½-ton	3,800	2,550
K 3½-ton	4 900	3,550
M 5-ton	5 900	4,000

REORGANIZING LOCOMOBILE

NEW YORK. April 19—Bank creditors of the Locomobile Co., now in receivership, are understood to be working out a plan for the reorganization of the corporation. Merchandise creditors will be permitted to come in under the plan on the same terms as the bank creditors. The demand for Locomobiles now is said to be large enough to justify reorganization.

Bid for Bethlehem Regarded Inadequate

Merchandise Creditors Will File Objection to Confirmation of Sale for $550,000

NEW YORK, April 19—Representatives of the merchandise creditors of the Bethlehem Motors Corp. will file in Federal Court at Philadelphia objection to confirmation of the sale yesterday by the receiver of the assets of that corporation on the ground that the high bid for the property was inadequate.

The high bid for the assets was made by Howard B. Hall of this city, formerly vice-president of the corporation, who offered $550,000 for all the real estate and personal property both at Allentown and Pottstown, Pa. The only other bid was that of the Creditors' Syndicate Committee which offered $540,000. Hall's bid was made in behalf of himself and other former officers, including Arthur T. Murray, who was president prior to the receivership and now is president of the American Bosch Magneto Corp.

In a recent letter sent to creditors by Murray and Hall, it was stated that they had a plan to rehabilitate the company and resume operations. The letter stated that if claims were assigned to "outsiders," the creditors would "simply afford an opportunity to junk the property and to make a profit on the claims held so long and doubtless prevent a reorganization and continuance of the business."

Kern Reported Interested

It has been reported that Martin E. Kern, who organized the company and whose purchase of the American Bosch Magneto interests from the alien property custodian is now being investigated by the Department of Justice, has been associated with Murray and Hall in their reorganization plan.

The creditors' syndicate committee represented the Chase National Bank and other banking interests which propose to take over the assets.

The upset price fixed by the court for the property was $450,000, but the assets have been appraised at $2,400,000. Merchandise creditors have contended that a bid of $600,000 should be the minimum accepted by the court. It is understood that if Hall's bid is refused there is a possibility of a reorganization under conditions which will practically guarantee creditors an immediate payment of 10 per cent in cash and a very substantial interest in a new company.

When counsel for merchandise creditors requested Judge Dickinson, the special master, to postpone the sale set for yesterday, he declined to do so on the ground that a bid of at least $600,000 would be made by certain interests connected with the old company. He consented, however, to extend the date of confirmation of the sale from April 24 to May 8.

Men of the Industry and What They Are Doing

Hohensee in Charge of Production

F. W. Hohensee, president of the Durant Motor Car Co. of New York, has been placed in general charge of production and engineering at the Long Island City, Lansing and Toronto plants of the Durant companies. Hohensee was one of the first executives to join forces with Durant and resigned as general manager of production for the Chevrolet Motor Co. to go with his former chief. He played an important part in getting the Long Island City plant into production in a remarkably short period.

Gallup Resigns from Marmon

David L. Gallup, for the last five years head of the division of research and experiment of the Nordyke & Marmon Co., has resigned, to take effect May 1. Gallup is well known in the industry and has been actively associated with the Society of Automotive Engineers, serving at one time as president of the Indiana section. Before entering the automotive industry at the Marmon plant, Gallup, for many years, was in charge of the automotive division of the Worcester, Mass., Institute of Technology.

Waterfall at Film Conference

Arthur T. Waterfall, vice-president of Dodge Brothers, has been named to represent the automotive industry at the Industrial Film Conference of the Committee on Motion Pictures, which will meet in New York on April 27. The committee will take up the work of drafting a report on the use of industrial films and their distribution, being the outgrowth of the recent industrial associations' conference with Secretary Hoover in Washington.

Rieman on Chicago Air Board

C. S. Rieman, president of the Elgin Motor Car Corp., has been appointed chairman of a committee of the Air Board of Chicago to co-operate with the Lincoln Park commissioners in laying out and developing an aircraft landing field.

Alford Elected a Councilman

Walter H. Alford, vice-president of the Nash Motors Co., has been elected a member of the Kenosha, Wis., city council for a two-year term.

Lount Is Cadillac Comptroller

H. J. Lount has been appointed comptroller of the Cadillac Motor Car Co. and has been succeeded as head of the factory accounting department by L. S. Carter. Lount has been with the company continuously since he began his association with it as a payroll auditor eighteen years ago. During the war he was associated in accounting both as to automobile and aircraft production. He was made factory accountant August 1, 1918, a position he has held up to the present time.

Sonneborn in Charge of Branches

Arthur B. Sonneborn, vice-president of the American Electric Fusion Corp., will be in charge of branch offices of that company opened in the Dime Bank Building, Detroit, and covering the Ohio, Indiana, Western Pennsylvania and Michigan territory. Sonneborn was formerly sales manager of the Detroit Electric Welder Co. and the Federal Machine & Welder Co.

Sam Miles Goes to Europe

S. A. (Sam) Miles, veteran automobile show manager, sailed from New York Wednesday on the Carmania with Mrs. Miles for his annual trip to Europe. He will spend most of his time in England, but also will visit the Continent to study prospects abroad for the sale of American motor vehicles and equipment. He expects to return some time in June.

Martin Now with Denman Tire

H. J. Martin, former advertising manager of the export department of the Firestone Tire & Rubber Co., has become promotion manager of the Denman & Myers Cord Tire Co., with headquarters at Warren, Ohio.

Dill Made Sales Director

George W. Dill, for many years associated with the Dayton Airless Tire Co., has been appointed director of sales of the Essenkay Products Co., Chicago, manufacturers of Essenkay and ammonia gas tubes. Dill was formerly in charge of the mail sales division of the Dayton company and later served as sales manager, a position he retained until his resignation to become connected with the Essenkay organization.

Davis Heads Apperson Branch

J. F. Davis, for fourteen years head of the Chicago branch of the Winton Co., has taken over the management of the branch in that city of Apperson Bros. Automobile Co., and will launch an aggressive sales campaign. Re-establishment of the Apperson sales rooms on Michigan Avenue is the first major move made by Davis.

Dodd Represents Crowley

Theodore L. Dodd, Chicago, has been appointed western sales representative of the D. J. Crowley Co. of Detroit. In this capacity he will look after the sales of the Penn Seaboard Corp. of Philadelphia, the Tacony Steel Co. of Philadelphia and the Titusville Forge Co., of Titusville, Pa.

Will Direct GTD Sales

Edward Blake, Jr., vice-president of the Greenfield Tap & Die Corp., who has been manager of the corporation's drill plant at Taunton, Mass., has been appointed vice-president in charge of sales, and will make his headquarters in Greenfield. Blake served as vice-president and general manager of the Lincoln Twist Drill Co. at Taunton until its sale to the Greenfield corporation in 1920. Ralph Barstow, former general sales manager, has resigned to associate himself with Marquis Regan as counsellors in merchandising and marketing, with offices at 21 East Fortieth Street, New York City. Barstow went to Greenfield in July 1919, after serving as director of the department of selling and advertising in the A. E. F. university at Beaune, France. For two years he has been an instructor in sales methods for the Massachusetts state university extension.

Lee Tire Names Wilkinson

Tom H. Wilkinson has been appointed Pacific Coast representative of the Lee Tire & Rubber Co. He resigned as manager of the San Francisco branch of the United States Rubber Co. recently, after serving for a period of 17 years with that corporation. Wilkinson's earliest connection with the industry was with the old Hartford Rubber Works Co., which he represented in the San Francisco territory. At that time he was an associate of Harry E. Field, now general sales manager of the Lee company. When the Hartford Works was absorbed by the United States Rubber Co., Wilkinson was retained, and since that time has held important executive positions with the latter company.

Schwab Heads Sales at Ford Branch

P. W. Schwab, connected with sales at the Ford branch in New York for a number of years, has been made head of the department under the general direction of Gaston Plantiff, branch manager. W. A. Francis, whom he succeeds, has been made branch manager at Cincinnati.

Seiberling, Jr., Distributing Cars

C. W. Seiberling, Jr., son of the president of the Seiberling Tire & Rubber Co., will distribute Wills Sainte Claire cars in New Mexico, with headquarters at Sante Fe, as a result of a co-partnership between him and F. P. Weaver.

Dolan Joins Mack

James F. Dolan, former division superintendent of the Willys-Morrow plant at Elmira, N. Y., has been appointed to an executive position with Mack Trucks, Inc., at New Brunswick, N. J.

Plants Speeding Up in All Branches of the Industry

Yellow Cab Triples Output

CHICAGO, April 18—The production of the Yellow Cab Manufacturing Co. for April will be more than three times the production for April of last year. The output at this time last year was five or six cabs a day, and it is now 15 to 20 a day. The shipments in March were 350 cabs. Several departments of the factory, including mill and machine shops, are working day and night. More of the cabs are now going to New York than to any other city. Sales are 50 days ahead of production, orders now in hand being sufficient to keep the plant busy until well into June.

Hendee Adds to Force

SPRINGFIELD, MASS., April 18—Hendee Manufacturing Co. has added 200 to its plant force, bringing the number to 1200, and is producing 100 motorcycles daily. A further increase is projected on the strength of incoming orders that assure brisk business at the plant for months ahead. All departments are working full time, and several are working overtime. Export business is showing an improvement, along with a big gain in domestic sales.

Building More Engines

PONTIAC, MICH., April 18—The Wilson Foundry & Machine Co. has been increasing production on the Willys-Knight engine for the Willys-Overland plant in Toledo rapidly since the installation of the plant here. Production during the past week has approached 100 engines daily and efforts are now being made to advance it to 150 daily. This would call for capacity production on the line with the present shifts at work.

Bosch Force Will Number 2000

SPRINGFIELD, MASS., April 17—The American Bosch Magneto Corp. is operating with a force of 1200 in its plant here, and it is said the force will be brought to 2000 soon. A largely increased business is being done with the battery ignition system for the Ford, and a similar equipment for the Chevrolet is now being placed on the market.

Reo's Question One of Production

DETROIT, April 17—Reo production has reached a point, officials declare, where it is not a question of how many cars can be sold, but how many can be built. There is every indication, the company reports, that this increase in business will be extended over the year and will not merely be a spring revival.

Westinghouse Adds to Plant

SPRINGFIELD, MASS., April 15—Owing to a heavy increase of orders, the Westinghouse Electric & Manufacturing Co. has begun the erection of an additional factory building of one story, 525 x 85 ft., here, to be completed in six weeks. This will enable the company to take on 500 additional employees.

TIRE FACTORIES ARE STEADILY MOVING FORWARD IN OUTPUT

AKRON, OHIO—Production has been increased from 22,000 tires a day to 24,000 daily by the Goodyear Tire & Rubber Co. following the employment of 1000 additional tire builders.

When Goodyear issued the call for 1000 men, it was the largest single labor call Akron had heard for many months. Goodyear started the year with an average production of 18,000 tires a day.

The Firestone Tire & Rubber Co. in the last five weeks has increased production from 18,000 to 21,000 tires daily.

SPRINGFIELD, MASS., April 18—New England Tire & Rubber Co. is establishing quantity production in its cord tire, and it is stated that carload lots are being shipped regularly to branches and dealer agencies. Sales Manager J. B. Cothran predicts that by summer the plant will be operating nearly at capacity.

White Sees General Improvement

CLEVELAND, April 17—The White Co. has received reports from all its 40 branches indicating a decided improvement in general business conditions with every prospect for increased sales. The demand for motor trucks to operate on railroads continues. A few of the railroads now operating White trucks on rails are the LaCrosse & Southeastern; Minneapolis, Verde Tunnel & Smelter; Clarksdale, Ariz., & Mt. Hood; Hood River (Oregon) and the Tennessee Midland.

Moon 50 Per Cent Better

ST. LOUIS, April 17—The Moon Motor Car Co. reports that its sales for March were 50 per cent greater than for March 1921 and 20 per cent greater than for March 1920. The production schedule has been increased, and the company says it has enough orders on hand to maintain the present schedule until July 15.

Stewart-Warner Output Doubled

CHICAGO, April 17—The Stewart-Warner Speedometer Corp. has increased its production from 4200 to 5130 units a day and vacuum tank production from 4000 to 4800 units a day. This is double the production a year ago and compares favorably with the record output of the company.

Cadillac Has Record Business

DETROIT, April 17—The Cadillac Motor Car Co. reports that the first quarter of 1922 brought the best business in its history. Its foreign shipments have increased materially since Jan. 1. The increases range from 37 per cent to 651 per cent over the same period in 1921. The largest increases have come from Argentina with 213 per cent, Cuba with 315 per cent, Australia with 420 per cent and Holland with 651 per cent. Shipments have been made since January 1921 to 28 countries.

Gardner Increases Schedule

ST. LOUIS, April 15—The Gardner Motor Co., which originally announced a production schedule of 1500 cars for April, has increased the schedule to 2000 for this month and 2500 for May. A statement issued by W. H. Yeldell, sales manager, says that the company has in hand orders for more cars than it will be able to produce up to June 1. Almost equal parts of the Gardner production for the last few months have gone to the east and to the west of the Mississippi River.

Improvement with Preston

BIRMINGHAM, ALA., April 18—J. T. Driver, vice-president of the Preston Motor Corp., manufacturer of the Premocar, reports that orders have been placed in this city alone to assure steady production for several months. The company also notes improvement in the foreign trade—having shipped three of its phaeton models to New Zealand this week.

Dort to Build 2000 Cars in May

DETROIT, April 17—The Dort Motor Car Co. will increase its schedule to 2000 cars for May to meet increased business. The inventories of the company will be brought to a low figure by early summer under the impetus of present business, being worked down from a figure approximately $2,000,000 a year ago.

Nash Reports Big Gain

KENOSHA, WIS., April 14—Nash Motors Co. reports an increase of more than 50 per cent in sales for the first quarter of 1922 as compared with the same period in 1921. There were on hand at the beginning of April delivery orders for 5025 four and six-cylinder cars as compared with 3307 at the same time last year.

Jordan Producing 40 Daily

CLEVELAND, April 14—Production at the factory of the Jordan Motor Car Co. has been increased to 40 cars a day, and it is expected the May output will be still larger.

Creditor Now Asks Kentucky Receiver

Suit Filed, Although Merger Plans Are Practically Completed

LOUISVILLE, KY., April 18—Two additional actions were filed yesterday to throw the Kentucky Wagon Manufacturing Co. into the hands of a receiver. At the same time it was learned that the committee seeking a merger with other companies in the Associated Motor Industries practically has completed all details and in a few days will announce the merger.

Both of the suits filed yesterday seek the appointment of a receiver to conduct the affairs of the company and also to consolidate the cases with two similar ones filed three weeks ago.

The Willard Storage Battery Co., plaintiff in one action, alleges that the company is indebted to it in the sum of $5,000 in notes.

The plaintiffs in the other actions are Eva F. Churchill, Willa F. Whitclock, J. M. Rogers, J. J. Shelley and Mrs. Lotta Lee Peter, executrix of the estate of R. A. Peter, all of whom are stockholders seeking to preserve their interests and the interests of others similarly situated.

The suits filed separately three weeks ago have been consolidated, and some proof has been taken in the form of depositions to be used when the motion for a receiver is heard by Judge Davis W. Edwards at a date yet to be agreed on by the attorneys. Those named party defendants to all the actions are Robert V. Board, G. E. Glazebrook, J. C. Murphy, James R. Duffin, John W. Barr, S. E. Duncan and I. T. Axton, the committee seeking the merger with several other corporations in different sections of the country.

Predicts Unlimited Credit for Dealer

WASHINGTON, April 17—Credit facilities for automobile dealers this year will be virtually unlimited to the dealer who is worthy of credit, according to a statement made here to C. A. Vane, general manager of the National Automobile Dealers Association, by Governor W. D. G. Harding of the Federal Reserve Board.

Banks have plenty of money, Governor Harding said, and are anxious to lend it where it will be productive. "But this is a period of settling business," the governor went on, " and money in all lines will be available only to the man who is worthy of credit."

The governor expressed considerable interest in the new membership requirements of the N. A. D. A., and his questions made it plain that he believed the dealers were doing a thing that would make it much easier for them to establish proper credit facilities with their bankers.

Vane left here for New York, where he expects to conclude final arrangements for fire, theft and transportation insurance for "One of a Thousand" members of the association. Present negotiations indicate that a saving of substantially 40 per cent will be effected for this contents coverage, placed in one of the biggest old line stock insurance companies in the world.

Highway Traffic Body Prepares for Meeting

NEW YORK, April 17—Among the subjects listed for discussion at the annual meeting of the National Highway Traffic Association, which will be held at the Automobile Club of America in this city, May 12, are traffic safety regulations governing speeds, weights and dimensions of motor trucks and trailers, license fees and highway franchises.

The national chairmen who have been asked to make reports on the conference are:

Elmer Thompson, secretary, Automobile Club of America, on uniform highway signs; Herschel C. Smith, assistant professor of Highway Engineering, University of Michigan, on traffic capacity and widths of highways outside of municipalities; H. Eltinge Breed, consulting engineer, New York City, on the status of the construction of highway curves and recommended practices to increase traffic safety; F. W. Fenn, secretary national motor truck committee, National Automobile Chamber of Commerce, on highway transport franchises; Tom Snyder, secretary, National Association of Commercial Haulers, on highway transport clearing houses; George H. Pride, president, Heavy Haulage Co., New York City, on regulations governing speeds, weights and dimensions of motor trucks and trailers; and Henry G. Shirley, roads and sanitary engineer, Baltimore County Roads and Sewerage Department, on license fees and motor vehicle taxation.

ZEDER FINANCING PLANS

CLEVELAND, April 20—Plans have been completed for financing the manufacture of the new Zeder car, but await the approval of certain interests in this city and New York before they are made public. A prospectus for the new company has been prepared and will be submitted in a few days to the persons interested. The new car will be made in the plant of the Cleveland Tractor Co. in this city, and the capitalization of that company will be increased to provide the necessary capital.

PACKARD EXPECTS GOOD YEAR

NEW YORK, April 20—The financial statement of the Packard Motor Car Co. for the six months ended Feb. 28 showed a loss in factory operations of $204.349 and through branch operations of $570,-198. It is expected, however, that the second six months of the fiscal year "will form a distinct contrast to the first, and that the year, as a whole, will prove a profitable one." Factory sales for the six months' period were $13,687,739, and the cost of sales $12,999,613. The balance sheet showed a net profit and loss surplus of $14,631,706.

Templar Syndicate Deposits $750,000

Funds Will Pay Off Creditors' Notes and Provide Working Capital

CLEVELAND, April 18—The Templar syndicate of which M. F. Bramley, president of the Templar Motors Co.; J. C. Brooks, an attorney, and W. M. Patterson, a Cleveland business man, are managers, has deposited $750,000 in the Guardian Savings & Trust Co. to pay off the notes of all creditors and to provide working capital for the Templar company.

It is announced that all outstanding notes and claims of all kinds will be paid and the balance of the funds will be used to carry on plant operations. Notices have been sent to all creditors of the company asking them to send their notes and claims to the Guardian Savings & Trust Co., this city. The bank will pay these liabilities.

The production of Templar is now on a basis of eight cars a day. The capacity is 25 cars a day. Business on the books indicates that May will be a better month than April for the company.

Midwest Tire Makers Report Bigger Output

CHICAGO, April 17—At the monthly meeting of the Midwest Rubber Association here several manufacturers reported noticeable increase in tire business, and one manufacturer said he was gradually increasing the price of his tires. About 30 members of the association and a number of guests attended the meeting, several western and midwestern cities being represented.

One manufacturer who a year ago last January made only 500 tires in the whole month said his production is now about 750 tires a day. Several others reported 24-hour operation with production of 1000 or more a day. One maker said his distributor at Atlanta, Ga., has sent in greatly increased orders in the last few weeks, and reported a business improvement of nearly 200 per cent in the last few weeks in that section of the south.

W. W. Wochter, president of the association, who conducts a tire manufacturing business at Omaha, Neb., said the business improvement was coming from the West and spreading toward the East.

LEE WILL ADDRESS MEETINGS

WASHINGTON, April 15 — Gordon Lee, chief of the automotive division of the United States Bureau of Foreign and Domestic Commerce, will address automotive men in the far West in June and July. He will speak at the summer convention of the Automotive Equipment Association at Colorado Springs, then going on for the annual meeting of the Washington State Automotive Trade Association at Olympia, July 21 and 22.

Prices of Franklin Reach Lowest Mark

Phaeton Now Listed at $1,950—Reductions Range from $450 to $650

SYRACUSE, April 17 — Reductions ranging from $450 to $650 on its various models, effective immediately, are announced by the Franklin Automobile Co. The list follows:

	Old Price	New Price
Roadster	$2,400	$1,900
Phaeton	2,450	1,950
Demi-Coupe	2,750	2,100
Demi-Sedan	2,850	2,250
Victoria Coupe	3,200	2,750
Brougham	3,300	2,750
Sedan	3,450	2,850

This reduction brings the Franklin cars to the lowest prices in the history of the six-cylinder type extending as far back as 1906, with the single exception of a four months' period in 1916. The war price of the phaeton was $3,100 and of the sedan $4,350.

The Franklin company was the first to follow Ford in the price reductions which came when the period of deflation was well under way. The drastic cut made at that time brought a very substantial business. Increases of $100 on its more popular models went into effect Feb. 1.

NEW TRIANGLE PRICES

ST. JOHNS, MICH., April 17—New prices are announced by the Triangle Motor Truck Co. on its four models. The list follows:

	Old Price	New Price
Model AA, 1-ton	$1,385	$1,285
Model A, 1½-ton	2,350	1,985
Model C, 2-ton	2,700	2,285
Model B, 2½-ton	2,950	2,585

PARKER TRUCK REDUCED

MILWAUKEE, April 17—Substantial price reductions are announced by the Parker Motor Truck Co. The list follows:

	Old Price	New Price
Model J 20, 3½-ton	$4,400	$3,950
Model M 20, 5-ton	5,500	4,850
Model C 22, 1-ton		1,875
Model G 22, 2½-ton		3,200

Model F20, 2-ton, will be discontinued.

WARD ELECTRIC REDUCTION

MT. VERNON, April 17—The Ward Motor Vehicle Co. announces price reductions ranging from 35 per cent to 40 per cent. The WS-2 model, ½-ton capacity, is now $2,485, and the WA-2 model, ¾-ton capacity, is now $3,295.

CHANGE IN SENECA PRICE

FOSTORIA, OHIO, April 17—The Seneca Motor Car Co. has reduced the price of its model M ½-ton truck from $920 to $820.

TEXAS MOTOR PLANT SOLD

FORT WORTH, TEX., April 19—The bid of the Moco Monkey Grip Rubber Co. of Oklahoma City, boot and patch manufacturers, for the plant of the Texas Motor Car Association, has been accepted by the court which previously had named receivers for the association. Bankruptcy proceedings against the association were dismissed yesterday. The bid for the plant, which cost $3,000,000, was $295,000. The Oklahoma factory will be moved here.

General Motors Elects Directors to Vacancies

WILMINGTON, DEL., April 19—At the annual meeting of stockholders of General Motors Corp. held here to-day, the twenty-eight directors now constituting the board of directors were re-elected and the three existing vacancies were filled by the election of:

George M. Hannum, general manager of the Oakland Motor Car Co., a division of the corporation.

Alex B. C. Hardy, general manager of the Olds Motor Works, a division of the corporation.

Herbert H. Rice, general manager of the Cadillac Motor Car Co., a division of the corporation.

Organization meeting of directors for election of officers for the ensuing year will be held in New York at 3 p. m. Tuesday, April 25.

U. S. Rubber Co. Reports Substantial Gain in Sales

NEW YORK, April 19—Charles B. Seger, president of the United States Rubber Co., issued a statement following the annual meeting of stockholders yesterday in which he pointed out that the company's business generally showed a steady improvement since the close of 1921 and that the sales for the first quarter of 1922 were considered satisfactory. He said:

Tire business has shown substantial gain in unit sales over the corresponding period of last year and an increase in dollar volume of sales notwithstanding a lower level of prices compared with last year.

Trade conditions among tire dealers point to a substantial increase in demand over last year.

Newcomb Carlton, president of the Western Union Telegraph Co. was elected a director. The other directors were re-elected.

ATWATER KENT INCREASES

PHILADELPHIA, April 15—Demands of automomobile manufacturers for electrical equipment have resulted in the Atwater Kent Manufacturing Co. increasing its output from 30 to 90 per cent of capacity within the last 60 days. A year ago the plant was on 40 per cent capacity and about 25 per cent four months ago.

GRAY & DAVIS GAINS

BOSTON, April 18—Gray & Davis, Inc., is feeling the full effects of the increase in automobile sales and reports that it is receiving a big volume of releases from all of its important customers.

Maibohm Plan Rests on Getting Simplex

Latter Would Be Marketed Instead of Former—Bankers Consider Bond Issue

NEW YORK, April 19—Receiver's sale of the assets of the Maibohm Motors Co., which was scheduled for to-day at Sandusky, Ohio, was again postponed to give further opportunity for a reorganization of the company. A New York banking house is seriously considering a bond issue of $500,000 and a stock issue of at least that amount, contingent upon the acquisition of the rights to manufacture the Simplex car, now owned by the Mercer Motors Co.

The reorganization plan is being promoted by H. C. Maibohm, who organized the Maibohm Motors Co., and it is understood he has obtained an option on the Simplex assets. If the plan goes through successfully it is understood that a new Simplex car will be placed on the market at a price radically less than that for which it formerly sold. The Maibohm will be discontinued but certain features of it may be included in the new Simplex, which will be produced in standard models at the Sandusky plant.

Simplex was operating as a separate entity when its sales were taken over with those of Mercer and Locomobile upon the organization of Hare's Motors. Prior to the dissolution of the contract with Hare's Motors, all the capital stock of the Simplex Automobile Co., Inc., was acquired by the Mercer company. Manufacture of the Simplex car has been discontinued.

$9,188,561 Is Sought from Lincoln Motors

(*Continued from page* 884)

DETROIT, April 19—W. C. Leland, general manager of the Lincoln Motor Car Co., issued a statement to-day in which he said the suit of the government was wholly unexpected, as a complete settlement was regarded as having been made three years ago. Both W. C. Leland and his father, Henry M. Leland, will take the witness stand to deny charges of profiteering and to defend the rights of Lincoln creditors.

In his statement Leland said there was no justification whatever for the presentation of any claim on the part of the War Department. From the time a complete settlement was reached in the early part of 1919 until the last of February, he declared, no one had the slightest idea or intimation that the government had any intention of overturning the settlement, "which was fully and fairly made and in which the government was represented by many very able men."

He added that he and his father were very anxious to have the case heard in court as quickly as possible to prove the charges unfounded.

Graham Resolution Meets Bad Weather

Promises of Legislative Leaders Far from Fulfillment—Objections to Overcome

WASHINGTON, April 19—It appears that promises of legislative leaders to protect American manufacturers and dealers against speculators in surplus army trucks originally sold the American Expeditionary Forces, as well as the British and French governments, are far from fulfillment.

Talks with senators and representatives showed that it would be necessary to eliminate objections among the minority to the consideration of the so-called Graham resolution, which would assess high tariffs on motor trucks, passenger cars and other surplus material re-imported and intended to compete with domestic products. It was believed that the Senate Finance Committee would incorporate a provision to this effect in the tariff bill, but the bill contains no such protection.

It is reported that senators on the committee felt that it would be possible to obtain quick action by rushing the passage of the Graham resolution, knowing that the tariff bill would be indefinitely delayed in the Senate and in conference, owing to the conflict as to valuation basis. The resolution has been called up several times at this session, but each time was tabled on the objection of various senators. The measure, as approved by the finance committee last year, would allow the speculators sufficient time to handle shipments after it became effective.

However, the Senate Finance Committee retained the provision of House tariff bill which levied the same internal tax on imported articles as assessed on domestic products. When the goods were shipped abroad, no internal taxes were paid on Government property.

Western Underwriters Urge Sterner Measures

CHICAGO, April 15—A conference to discuss means of reducing the number of automobile thefts throughout the country was held in Chicago this week by managers and representatives of the various automobile insurance theft bureaus and representatives of the Western Automobile Underwriters Conference.

The meeting was suggested some time ago by the national theft committee of the National Automobile Underwriters Conference. The opinion was held among those at the conference that automobile stealing will continue to increase until thieves are more severely punished than they have been in the past. There was considerable discussion of the Dyer Law which makes it a Federal offense to transport a stolen car from one state to another.

It was suggested that automobiles should be inspected by the state before licenses are issued, and that this would result in reducing the number of thefts. It was said that in many cases automobile thieves have been released upon payment of a light fine or after serving a short sentence. In many cases it was said the reluctance of the insurance companies to push the case against the automobile thief has resulted in turning loose countless numbers of automobile thieves.

FINANCIAL NOTES

General Tire & Rubber Co. has declared the regular quarterly dividend of 2 per cent on common stock payable May 1 to a stock of record April 20. The company on April 1 paid a 1¾ per cent dividend on preferred stock. General was one of the few tire companies in the country which did not suspend dividend payments during the slump period.

American La France Fire Engine Co.'s report for the quarter ended March 31 shows net income amounting to $196,049 before Federal taxes but after interest charges. This compared with net profits of $183,950 in the corresponding period in 1921. The income account lists operating profit at $205,217 against $225,814 in the preceding year.

Grand Rapids Tire & Rubber Corp. announces the payment on April 1 of the regular 2 per cent quarterly dividend on preferred stock. The corporation has increased its distribution to a point where it is represented in every state in the country.

Franklin Automobile Co. has declared the regular quarterly dividend of 1¾ per cent on preferred stock payable May 1 to stockholders of record April 20.

WIN LOCK PATENT SUIT

LOS ANGELES, April 15—The United States District Court here has granted an injunction and damages to the Miller-Chapman Co. of Los Angeles and the Security Manufacturing Co., manufacturers of the Red Security Auto Theft-signal, against the Los Angeles distributor of the Green Lock Co. of Detroit, Mich. The court decided the patent of the latter company an infringement.

LAMP SUIT DISMISSED

BALTIMORE, April 19—Judge Rose has handed down an opinion in the United States court dismissing the suit of August R. Gross against Joseph Frank for alleged infringement of a patent for a parking lamp for automobiles. Gross conducts a business as the General Machine & Specialty Co., and Frank as the Arjo Manufacturing Co. Both are located in Baltimore.

GOODRICH DIRECTORS RE-NAMED

NEW YORK, April 20—Directors of the B. F. Goodrich Co. were re-elected at the annual meeting of stockholders. The regular dividend on the preferred stock was declared at a meeting of directors which followed.

BANK CREDITS

Written exclusively for AUTOMOTIVE INDUSTRIES *by the Guaranty Trust Co., second largest bank in America.*

Last week's money market showed signs of continued ease. Call loans covered a range of 4 per cent to 4½ per cent, as compared with 4½ per cent to 5 per cent in the previous week, and on April 17 the ruling rate was 3½ per cent. An easier undertone was also apparent in the rates for fixed date funds. Toward the last of the week there was a decline to 4½ per cent for all periods of from sixty days to six months, as against 4½ per cent for sixty and ninety days and four months, and 4½ per cent to 4¾ per cent for five and six months' maturities in the previous week. The price commercial rate remained unchanged at 4½ per cent to 4¾ per cent.

A significant event in last week's money market was the offering of $150,000,000 of United States Treasury Certificates at 3½ per cent. This is the lowest offering rate since September, 1917. The last previous offering on March 15, 1922, was at 4¼ per cent. This, taken in conjunction with the lowering on April 13 of the Bank of England's discount rate to 4 per cent, strengthens the belief held in some quarters that a lower official rate may obtain in New York.

The Federal Reserve Bank of Richmond reduced its rediscount rate on all classes of paper from 5 per cent to 4½ per cent, effective April 14. Only three banks, the Dallas, Kansas City and Minneapolis institutions, now retain a 5 per cent uniform rate, the others having a 4½ per cent rate.

The foreign trade figures for March show exports at $332,000,000, the highest amount since October, 1921, and imports at $258,000,000, the greatest for any month since December, 1920. The export balance of $74,000,000 compares with $35,000,000 in February and $135,000,000 in March, 1921, and is the largest favorable balance since November, 1921, when the excess of exports amounted to $83,000,000.

Wholesale price indices for March show a decline, Dun's figures registering a decline of 2 per cent and Bradstreet's 6/10 of 1 per cent.

Staring to Manage New Walker Engine

CLEVELAND, April 20—The H. J. Walker Co., manufacturer of automobile engines, expects to announce in a few days completion of a plan for refinancing the company, by which it will have $300,000 additional cash working capital. A $390,000 common stock syndicate subscription was oversubscribed by $40,000. W. H. Staring, who was formerly vice-president of the Peerless company, is to have the management of the Walker company. The syndicate taking charge of the refinancing is headed by the Krouse, Tremaine & Kulas Co.

Capacity of Truck Plants Seen by Fall

Production in Detroit District Is Now Running Close to 50 Per Cent

DETROIT, April 18—Truck production in the leading factories of the district is now running close to 50 per cent of capacity with increases in business accumulating which promise capacity production by early fall with a gradual stepping-up throughout the summer. The demands run from 1-ton to 3-ton sizes. Most of the business is in the lighter vehicles, but with gradually increasing business in the heavier models.

Road work is responsible for most of the 3-ton sales at this time, these vehicles being equipped with pneumatics because of the greater traction offered on weak, yielding surfaces. Although most of the Government war trucks were alloted to state highway departments, it is found that these are being used mainly for maintenance and repair work.

Contractors on new roads are in the market for trucks. Building contractors in the cities are found to be turning to lighter models because of their greater responsiveness in heavy traffic. Some manufacturers of trucks are viewing with alarm the increased activity of highway officials in limiting loading capacity, but others regard this as something which will work out favorably for the truck industry as making for longer life of vehicles.

Reduced rates on automobiles carried on Detroit & Cleveland Navigation Co. boats are effective to-day. The open car rate is reduced 15 per cent and the closed 25 per cent. The new rates are practically the same as pre-war rates.

Car Business to Continue Heavy

DETROIT, April 19—Three factory conventions held in the Detroit district the past week have given indications of continued heavy absorption of automobiles for an indefinite period. These conventions were held by the Maxwell Motor Corp., the Reo Motor Car Co. and the Detroit Electric Car Co.

As nearly as can be estimated, the ratio of replacement and first car buying is about three to one. Reports from territorial men attending these conventions showed that dealers in most parts of the country are handling their replacement business in a way which permits quick turnover of the exchanged car at a profit. The factories realize that new car business will be large only as long as used cars are kept moving at a proportionate rate.

Edsel Ford Optimistic Over Business Outlook

NEW YORK, April 20—Edsel B. Ford, president of the Ford Motor Co., in a statement here yesterday took an exceedingly optimistic view of the industrial outlook. He declared his company expects its production for the year to reach a high water mark of 1,150,000, compared with 1,038,000 cars and trucks last year. He added that the new plant at Green Island near Troy, in which all ball bearings and roller bearings will be manufactured, will be in operation late in the year. Ford stated that no further reduction in the price of Ford cars is contemplated at this time, notwithstanding prospective competition.

INDUSTRIAL NOTES

K. O. Muehlberg Co. of Manitowoc, Wis., manufacturer of a new type of automatic drill and other mechanical devices for automotive, gas engine and service shops, has acquired the Hoffman Glove Co.'s factory in that city. The Hoffman company is moving to Chicago, and will give possession about May 1. Karl O. Muehlberg began manufacturing tools several years ago and incorporated about three months ago. The industry has grown so rapidly that a number of buildings in addition to the original shop have been leased for short terms to keep production apace with demand.

Dickinson Cord Tire Corp., New York, announces the following officers: President, F. S. Dickinson; secretary, E. W. McCarty, active head of the J. C. McCarty Co., New York; treasurer, C. H. O'Connor, New York, identified with real estate and insurance interests; directors, Louis C. Block, Philadelphia, former Ford branch manager and now distributor for the Gray Motor Corp. and N. R. Bagley, president of the N. R. Bagley Co., New York.

International Harvester Co. will open bids this month for the construction of two units of the motor truck plant it will build at Fort Wayne, Ind., and expects to begin actual work May 1. Each of the buildings will be 200 x 600 feet and will cost $1,000,000. Much preliminary work has already been done at the site of the plant where the company owns several hundred acres of land.

Curtis Motor Car Co., Little Rock, Ark., has been placed in the hands of H. V. Forl as receiver upon petition of one of the stockholders, Dr. Benjamin A. Adams. The company was organized in 1919 but was not incorporated. About 25 or 30 cars were completed at the plant in Little Rock.

Studebaker Corp. has plans underway for a new power house at its plant in South Bend to cost about $750,000 and a storage and shipping building provided with crate handling and conveying machinery estimated to cost approximately $500,000.

Hinckley-Myers Co., Jackson, Mich., has opened its eastern sales and executive office in the General Motors Building, Detroit. William A. Kent is the eastern sales manager and John E. Moore, general sales manager.

Simms Magneto Co. will open a branch office and show room at 5781 Woodward Avenue, Detroit, May 1, with L. F. Acker in charge. The branch will cover the states of Ohio and Michigan.

BRITISH EXPORTS DECLINE

WASHINGTON, April 18—Automobile exports in Great Britain for February show a big decline over the previous month, there being £100,001 worth exported in February against £147,254 in January, according to reports received by the Automotive Division of the U. S. Department of Commerce.

METAL MARKETS

Actual steel consumption, always more or less of a mystery, is the unknown quantity in the present steel market. Mill output at this time has grown probably to a rate of 37,000,000 or 38,000,000 tons a month, as compared with just about one half that tonnage last December, and statistically this is looked upon as the apparent consumption. In the present condition of the steel industry and its principal consuming arteries it is, however, obvious that there must be a wide discrepancy between apparent consumption or mill production and actual consumption or the amount of steel that goes into finished products and therefore disappears definitely from reserve holdings. In the absence of figures covering actual consumption which are unobtainable, sentiment counts, and many shrewd market observers are of the opinion that a much larger tonnage of the steel now being produced is intended for reserve than was the case during the year's first quarter.

All of the tonnage that mills are now working on was sold at the prices that prevailed previous to April 1, and a large number of consumers have not only covered their wants for the second quarter at these prices but, unless their own consumption should undergo unexpected increase, they will have some reserve stocks to draw upon after the first half of the year has passed into history. Automotive plants that have covered their sheet wants until June care very little whether the market at the higher prices proclaimed April 1 is characterized as firm or not. They will not begin to worry on that score until much of the steel now due them from mills at old prices has been worked up.

There have been quite a few odd lot sales of sheet bars at $31, Pittsburgh or Youngstown, and in at least one transaction an even higher price has been mentioned. In spite of many misleading headlines in the daily newspapers there is no shortage of coal at the steel mills but as the result of the Connellsville region walkout of non-union miners there is a temporary curtailment in the coke output of bee-hive ovens that supply fuel for about one-fifth of the country's blast furnaces. Conservation of semi-finished steel for producers' own finishing mills comes as a natural precaution but there is no more justification for a panicky feeling regarding steel mills' fuel supply than there was at the outbreak of the strike.

Pig Iron.—The coal strike is being used as chief argument in support of advance of 50¢ @ $1 per ton on all grades and in all markets.

Aluminum.—The market for 98 to 99 per cent pure virgin ingots has hardened and lots below 18¢ have generally disappeared. With the Senate Finance Committee concurring in the aluminum schedule of the Ways and Means Committee of the House, importers, while still hoping against hope for a more moderate rate of duties as the result of arguments on the floor of the Senate or in the conference committee, are laying out their program resigned to the seemingly inevitable. The very large warehouse stocks of ingots make it dubious whether large holdings at the time when the tariff law goes into effect would prove profitable within a reasonable time. The situation with reference to sheets is somewhat different. Undoubtedly these will be considered a good investment with the expected rise in tariff rates.

Copper.—Although domestic sales are not large the market's tone is slightly better.

Calendar

FOREIGN SHOWS

March 10-July 31—Tokio, Japan, Peace Exhibition.

April 16-23—Mexico City, Annual Automobile Show, Auspices of the Automotive Division of the American Chamber of Commerce.

April 22-May 1—Prague, Czecho-Slovakia, Fourteenth International Automobile Exhibit.

May — Shanghai. Exhibition of Road Building Material.

May, 1922—Quito, Ecuador, Agricultural Exposition, celebrating Centenary of Ecuador. Automotive Section.

May 1-15 — The Hague. Automobile Show, also Airplanes and Motorboats. Secretary, Spui 185, The Hague.

May 6-21—Scheveningen, Automobile Show.

May 24-June 5—Barcelona, Spain, Automobile Show under Dealers' Direction.

May. 28-June 5—Prague. Motor Show. Hotel de Ville.

July 1-24—London (Olympia). Aircraft Exhibition.

Sept. 1922 — Rio de Janeiro, Brazil, Automobile exhibits in connection with the Brazilian Centenary Associação Automobilista Brazileria.

Sept. 15-20—The Hague. Automobile Show.

September—Buenos Aires, Argentina, Annual Exhibition, Sociedad Rural Argentina.

October — Paris, Automobile Show.

Oct. 12-23—London (Olympia). International Commercial Vehicle Exhibition.

Nov. 3-11 — London (Olympia). Automobile Show.

Nov. 10-Dec. 19 — Brussels. Automobile Show, Palais de la Cinquantenaire.

Nov. 29-Dec. 4—London (Olympia). Cycle and Motorcycle Show. British Cycle Motors, The Tower, Warwick Road, Coventry.

November—Buenos Aires, Argentina, Annual Exhibition, Automovil Club Argentino.

CONVENTIONS

April 20-22—Buffalo, N. Y., Sixth Annual Convention of the American Gear Manufacturers Association.

May 8-10—New York, National Association of Manufacturers.

May 10-12—Philadelphia, Ninth National Foreign Trade Convention of the National Foreign Trade Council.

May 12—New York, Annual Meeting, National Highway Traffic Association, at the Automobile Club of America.

May 16-18—Washington, D. C., Annual Meeting of the Chamber of Commerce of the United States.

May 22-25—New York, Palisades Interstate Park, Second National Conference on State Parks, Bear Mountain Inn.

June 11-15—Milwaukee, Annual International Convention of the Associated Advertising Clubs of the World.

June 19-24—Colorado Springs, Summer Meeting, Automotive Equipment Association.

June 26-July 1—Atlantic City, Twenty-fifth Annual Meeting of the American Society for Testing Materials, Chalfonte-Haddon Hall Hotel.

August 28 - Sept. 2 — Detroit, National Safety Congress.

Sept. 18-23, 1922—Rome, Italy, Second Annual Meeting of the International Chamber of Commerce.

S. A. E. MEETINGS

June 20-24 — White Sulphur Springs, W. Va., 1922 Summer meeting of Society of Automotive Engineers.

New Haven, April 21; Cleveland, April, 21; Detroit, April 21; Philadelphia, April 27; Indianapolis, May 8; Chicago, May 12; Detroit, May 19. The Pennsylvania section will hold an outing at Torresdale or a body meeting on May 25.

February Big Month in Canadian Exports

Shipments of Cars Gain 100 Per Cent Over January—Trucks, 39 Per Cent

WASHINGTON, April 18—Canadian automobile exports in February compared with January of this year show an increase of approximately 100 per cent in the number of passenger cars and 39 per cent increase in the number of trucks exported, according to reports received by the automotive division of the United States Department of Commerce.

The February exports of passenger cars were 2719, valued at $1,539,936, but only two came into the United States, these being valued at $2,335. January exports were 1344 passenger cars, valued at $904,667, of which 5 were imported into the United States, these having a value of $7,240.

More Trucks Exported

There were 264 trucks valued at $119,619 exported in February, compared to the exportation of 98 trucks valued at $43,962 in January. Of the February trucks exported, but one came into the United States, valued at $2,500, while none were imported into the United States in January.

Repair parts exported in February were slightly less than the January exports, there being $188,923 January repair exports against $105,913 February shipments.

Of the 2719 passenger cars exported from Canada in February, the last month for which figures are available, 1267 went to Australia; 547 to the United Kingdom; 204 to Argentina; 162 to South Africa; 107 to the Dutch East Indies and the remainder to more than 50 other countries.

Practically all of the trucks exported went to Australia during February, as did more than 50 per cent of the repair business. British India ranked second with 21 trucks received; Ceylon third with 17, and United Kingdom fourth with 16 trucks imported from Canada.

The declared exports from the United States during February were 3096 passenger cars and 454 motor trucks. Adding these to the Canadian shipments, a total of 5815 cars and 718 motor trucks are shown. No month since December, 1920, has shown a higher volume of passenger car exports.

Belgian Law Regulates Equipment on Trucks

WASHINGTON, April 14—In an effort to save the newly constructed highways of Belgium, legislation has just been passed compelling all motor trucks and trailers, weighing one ton per axle and over, to be equipped with rubber tires, according to foreign information of the U. S. Department of Commerce.

The same bill provides that all mufflers must exhaust downward against the ground. The existing laws require that all mud guards must be constructed so as to prevent all scattering. How this is to be done, however, is not stipulated in the bill, although the regulation requirements of the city of Brussels require a wide flange on the guard, which more or less prevents excessive spattering of mud.

S. M. KITCHIN DIES

RICHMOND, IND., April 18—Announcement is made of the death of S. M. Kitchin, for years connected with the Auburn Ignition Manufacturing Co., Inc., and other manufacturing and selling companies in the automobile and hardware fields. Kitchin served as sales manager, general manager, vice-president and director of the Auburn company.

State to Build Road for Motor Truck Use

30-Mile Stretch Will Parallel Boston Post Road in Connecticut

HARTFORD, CONN., April 18—State Highway Commissioner Charles J. Bennett has announced that the thirty-mile concrete state highway, which will be built exclusively for motor trucks, will extend from Bridgeport to the state line at Greenwich and will parallel the Boston Post Road. This is said to be the first time in the history of American road building that such a road has been seriously considered by reason of the expense involved.

Surveys are now being made by the highway department and the project is being closely observed by the Federal government. The highway commissioner is personally supervising the making of the surveys. In addition, the highway commissioner is to have the Boston Post Road surveyed from the air, the object being to secure a panoramic view. These views, which will be joined together, are to be taken at the busiest time of the day. It is said that traffic is heavier on the Boston Post Road than on any other road in the country.

Cost Estimated at $1,500,000

Bennett estimates the cost of the thirty-mile truck road at $1,500,000. It was deemed advisable to construct a road exclusively for trucks rather than widen the present highways to accommodate the heavy commercial vehicle travel. Statistics show that an average of 10,000 vehicles a day travel over the road, and of this number trucks are represented to the extent of 2000, most of them long distance freight haulers.